

This Week

Foundrymen have been doing things with cast iron and the technique for more and better castings was the subject at their 40th annual convention. Gray iron and its many alloys were discussed in great detail. The report is enlightening. It will be found on page 696.

The article on Stroboscopes which so many readers enthused about last week is completed in this week's issue on page 690.

The United States Coast Guard has a trailer of unusual construction. How it was made is described on page 698.

On page 700 there is a description of a transmission for which a patent has been granted.

Auburn Reports Loss

The Auburn Automobile Co. reports a consolidated net loss for the company and its subsidiaries of \$703,564 for the first quarter, ended Feb. 29, 1936.

The report made to the stockholders on Jan. 20, anticipated a loss for the first three months of the company's year, due to delays which had held up production of the new Cord models. With the delivery of Cord phaetons, which was started on May 1, development work on the new Cord car was completed.

Beginning May 1, drastic economies were effected, not only in the plants of the Auburn Automobile Co. but in all its subsidiaries, which it is thought will materially affect operations hereafter.

Hupp Suit Ended

With New Capital, Could Resume in Two Weeks, Say Directors

Hupp Motor Car Corp. will be in position to resume operations on its 1936 cars within two weeks of the time new money is supplied, say officials. Directors are now working on a new plan for raising the necessary working capital, which it was intimated might be preferred to the plans laid aside last year on account of the litigation. These involved an application for a \$1,500,000 loan from the Federal Reserve Bank of Chicago and an application to the S. E. C. to issue 193,463 shares of re-acquired stock.

Officials would not state what the new plan involved, nor could they say when to expect an announcement, but indicated they might be pretty well along with the plans by another week.

Directors on Wednesday elected Wallace Zweiner to the office of president which has remained open since the resignation of Verne Drum shortly after the plant was forced to close last December. Mr. Zweiner came to Hupp as treasurer a couple of years ago.

(Turn to page 686, please)

AUTOMOTIVE INDUSTRIES

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May Presses Hard on April For Year's Production Peak

**Registrations Top Like 1935 Period
By 18 Per Cent With Sales for
the First Four Months at 1,042,000**

There has been no change this week from the recent high level of factory operations. It is expected that May will end with a total of cars produced very close to that of last month, and only a moderate decline is anticipated for June.

In a year when business is generally on the up-grade, the seasonal drop from spring to summer is very small. No figures are as yet available on sales during the first 10 days of May but there is a feeling in the trade that the month stands a good chance of making the year's peak. At any rate, it looks like a neck and neck race between April and May in both production and sales.

New car registrations for April amounted to 352,000, an increase of more than 11 per cent over the 319,650 units registered in the same month a year ago, and a gain of approximately 19 per cent over March of this year, when about 298,000 units were registered, according to an estimate based on official returns from 15 states. This is the best April since 1930 when 357,064 new cars were registered.

Based on these partial returns Chevrolet still maintains its substantial lead in the field with approximately 106,000 units as compared with 75,083 a year ago, an increase of 41 per cent. While Ford is showing a considerable decline from the same period last year, he is still in second place with 75,500 units as against 105,479 during April, 1935, a loss of 29 per cent. These two makes of cars have reversed positions as to number of units registered this year in comparison with a year ago. Plymouth remains in third place with an estimated figure of 49,000 units.

During the first four months of the year, well over one million new cars were registered as compared with 888,379 during the comparable period of 1935, an increase of nearly 18 per cent. Estimates based on partial returns for April indicate that about 1,042,000 new passenger cars were retailed during the first four months of the year.

The combined registrations of cars

and trucks, should our estimates be within a fair degree of accuracy, amounted to about 414,500 units, an increase of 13 per cent over the 366,435 new cars and trucks registered in the same month of 1935.

On May 7 production of 1936 Buicks exceeded the entire output of the 1934 and 1935 models combined, according to company officials.

General Motors Fleet Sales Corp. has announced that April deliveries of cars and trucks to fleet operators has exceeded by 12 per cent the best month in the history of this division, and that sales for the first four months were 41 per cent ahead of last year. Orders for the new General Motors light taxicab total 3000 and output is now 50 per day.

From the Pontiac factories, April output totaled 21,046 and was the biggest month since 1929. This figure compares with 14,666 cars in March and 18,749 cars in April, 1935.

Chrysler dealers' used car sales for the four weeks ended April 25 totaled 34,663 units. Used car stocks have been cut to 5½ weeks' supply compared with 9 weeks' supply three months ago.

(Turn to page 687, please)

Ford Raises Discount

Now 24% on Passenger Cars, No Change for Trucks

Discounts on Ford passenger cars were increased from 22 to 24 per cent effective May 10. The increase was not retroactive and hence does not apply to stocks in dealers' hands, nor does it apply to trucks and commercial cars on which the 22 per cent discount continues.

The new discount compares with 24 per cent on Chevrolet, and Plymouth margins of 21 per cent on the deluxe series and 18 per cent on the business models.

The quantity bonus announced by (Turn to page 686, please)

New Trade Treaty With France

Reciprocal Agreement Gives U. S. Supplementary Quotas for Cars, Lower Tariffs for Parts

Expansion of American exports of automotive products to France are looked for as the result of concessions granted by France to the United States in the Franco-American reciprocal tariff agreement announced by the State Department on Tuesday. Except for spark plugs and parts the only reductions in duties, amounting to 50 per cent, will apply to the minimum rates on chassis for passenger cars, except for buses. On these chassis, which are to be imported for French custom body builders, the cut in duties has been supplemented by an increase in the annual quota to 3062 quintals in addition to the present quota of 932 quintals. (One quintal equals 220.4 lb.) The quota on exports of these chassis therefore is increased from 91 to 207 gross tons.

Supplementary quotas of 3331 quintals have been granted for passenger cars with bodies, and 3419 quintals for bodies and parts of bodies in addition to the present quotas of 6512 and 4848 quintals, respectively. A supplementary quota of 3000 quintals has also been obtained for those automobile parts and accessories which are under quota restrictions, in addition to the present quota of 21,938 quintals. Protection against increased import duties is also assured for certain other automobile parts and accessories which are not under quota restriction.

These include hoods for motors; shock absorbers and parts; transmissions; steering apparatus, with or without steering wheels; gear boxes; axles, without wheels and mounted on wheels; stub axles and axle parts; metallic brakes and parts of metallic brakes

without brake lining; other parts and spare parts (other than in a rough state), not dutiable elsewhere, weighing less than 500 grams per unit, made of any other material than precious metals or fine materials (such as ivory, shell, mother-of-pearl, amber or amber compound).

French imports from the United States of motor vehicles, parts and accessories (Turn to page 684, please)

Singer Confirmed as AAA General Manager

Russell E. Singer will continue to operate in the capacity of general manager of the American Automobile Association, according to an announcement of the president, Thomas P. Henry. After the death of Ernest N. Smith, executive vice-president of the association, Mr. Singer assumed his duties. It was further stated by Mr. Henry that no changes in personnel of the national headquarters are contemplated.

Mr. Singer became associated with the A.A.A. as assistant to Mr. Smith in 1924. He has successively filled the posi-



Russell E. Singer
general manager of the American Automobile Association

tions of manager of the club service department, assistant secretary and general manager, and more recently, general manager.

Trade-Ins on 85% of New Cars Sold

Highest Ratio Ever Reached, According to NADA Summary of Operations of 1327 Dealers Last Year

Merchandising trends among automobile dealers during 1935 are revealed in a report covering the selling operations of 1327 representative dealers.

published in the May issue of the N.A.D.A. Bulletin.

Installment sales in 1935 amounted to 58 per cent of the total sales of new cars and trucks, an increase of 3.6 per cent over 1934. Used car and truck sales on installments also increased in 1935, totaling 62.6 per cent, as compared to 58.0 per cent in 1934. The combined installment sales of new and used cars and trucks for 1935 amounted to 60.8 per cent, an increase of 4.0 per cent over 1934.

Used cars traded in on the sale of new cars increased considerably, the percentage in 1935 being 84.8, as compared to 74.7 in 1934. Used cars traded in on the sale of used cars during 1935 also went up, being 55 per cent as against 47.3 per cent in 1934. This is the highest percentage of used car trade-ins on other used cars recorded since 1927 when N.A.D.A. started compilation of these statistics.

The total trade-ins, in per cent of new cars and trucks sold for 1935, was 171.6 per cent, compared to 150.4 per cent for 1934. Used cars sold, in per cent of new cars sold, also showed a slight upward trend, the percentage for 1935 being 173.1 as against 172.2 per cent in 1934.

The average reporting dealer juked (Turn to page 688, please)

1935 Car Selling Trends

	Commercial Car Sales	Passenger Car Sales	1935 Total	1934 Total
Dealers Reporting.....	840	1,327	1,327	1,370
New Cars Sold at Retail.....	26,321	223,271	249,392	143,843
New Cars Sold on Installment.....	14,723	130,013	144,736	78,204
Used Cars Sold at Retail.....	27,315	366,465	393,780	230,223
Used Cars Sold on Installment.....	15,846	230,679	246,525	133,393
Used Cars Junked.....	3,545	34,691	38,236	17,527
Used Cars Traded on New Car Sales.....	18,182	193,418	211,600	107,490
Used Cars Traded on Used Car Sales.....	12,914	203,799	216,713	108,882
Total Used Cars Bought.....	31,096	397,217	428,313	216,372
Average New Car Sales per Dealer.....	31.3	168.	188.	105.
Average Used Car Sales per Dealer.....	32.5	276.	297.	168.
Average Used Cars Bought per Dealer.....	37.	299.	323.	157.9
Average Used Cars Junked per Dealer.....	4.2	26.	28.	12.7
Percentage Sold on Installment:				
New Cars.....	65.9	58.2	58.0	54.4
Used Cars.....	58.0	62.9	62.6	58.0
All Cars.....	57.0	61.2	60.8	56.8
Percentage of Trade-ins and Used Car Sales:				
Trade-ins on Sales of New Cars.....	69.1	86.6	84.8	74.7
Trade-ins on Sales of Used Cars.....	47.3	55.6	55.0	47.3
Total Trade-ins in per cent of New Cars Sold.....	118.1	177.9	171.6	150.4
Used Cars Sold in per cent of New Cars Sold.....	117.2	179.6	173.1	172.2
Used Cars Junked in per cent of Total Trade-ins.....	11.4	8.7	8.9	8.1
Inventories:				
New Cars on Hand 1/1.....	1,188	10,827	12,015	4,813
New Cars on Hand 12/31.....	2,486	23,135	25,621	7,758
Used Cars on Hand 1/1.....	3,202	29,959	33,161	19,223
Used Cars on Hand 12/31.....	4,604	44,711	49,315	24,805
Per Cent Change N. C. Inventory.....	+109.26	+113.68	+113.24	+61.19
Per Cent Change U. C. Inventory.....	+43.79	+49.24	+48.71	+29.04

More Space for Boeing

Numerous Plant Additions and Extensions Are Announced by Other Automotive and Allied Firms

Construction of a large and modern assembly units costing more than \$250,000 was begun in May by the Boeing Aircraft Co. of Seattle on a 28-acre tract recently purchased adjacent to Boeing Field.

Sufficiently large to accommodate nine fully assembled Boeing 299 four-engined bombers, the new structure will be 204-ft. wide, 304 ft. long and 53 ft. high, with an interior unobstructed floor space measuring 200 by 300 ft. and with interior overhead clearance of 35 ft. In addition, there will be a one-story power house, 35 by 50 ft., which will house a heating plant, transformers and compressor equipment.

Expansion of the Buick forge plant has been decided upon to care for increased demands on its facilities. An addition to be constructed for housing the forge heat-treating units will permit a revamping of the forge division to increase its capacity.

New heat-treating equipment will be installed in the new building, construction of which is expected to get under way within a few days. The cost of the new structure, exclusive of equipment, will be more than \$26,000. Its dimensions are 128 ft. by 70 ft. and 38 ft. high.

Increased activities in the automotive industry are reflected in the establishment of a second automatic screw machine and small parts processing plant by the AC Spark Plug division of General Motors. The new plant occupies floor space in a building nearly a block long. Installed in the plant, which is said to be an ideal example of a machine shop from the standpoint of working-conditions and manufacturing efficiency, are automatic screw machines, drill presses, bench lathes and milling machines.

Fairbanks, Morse & Co., Chicago, is engaged in an extensive improvement program at its main production works at Beloit, Wis. A new pattern shop and storage house, 81 x 231 ft., is under construction, and the service building will be extended 168 ft., to house the welding department.

Waukesha Foundry Co., Waukesha, Wis., manufacturer of aluminum and brass castings, nickel-alloys, etc., has leased the adjacent plant of the old I. B. Rowell Co., agricultural tools, 100 x 150 ft. in size, and will devote it to production of bronze castings. Its own plant, 110 x 225 ft., will henceforth be used exclusively for nickel-alloy and aluminum casting.

Globe-Union Mfg. Co., of Milwaukee, is building a branch factory at Atlanta, Ga., which will start production in June, according to an announcement by the president, C. O. Wanvig. The Atlanta factory is one of three being built

this year by Globe-Union, the other two being at Dallas and Los Angeles.

Ramsey Accessories Mfg. Corp. is now building an addition to the Ramco plant in St. Louis. This is the second addition within two years, and is said to be completely modern in every detail.

Airtemp, Inc., air-conditioning subsidiary of Chrysler Corp., will move its manufacturing operations from Detroit to Dayton, Ohio, early in June, where it will occupy the former Maxwell plant.

Motor Wheel Corp. of Lansing, has let a contract for the construction of a steel warehouse to cost approximately \$75,000. The building will be 80 by 400

ft. and is due to be completed by July 1. A part of the new building will be used for manufacturing purposes.

Covered Wagon Co. announced last week a further expansion in plant facilities which will include 40,000 additional sq. ft. A new spraying and drying unit will be the largest feature of the new equipment.

Oscar Stegeman

Oscar Stegeman, founder, president and chief engineer of the old Stegeman Motor Car Co., Milwaukee, builder of Stegeman motor trucks a generation ago, died May 8 after an illness of more than three years. He was one of the earliest members of the Society of Automotive Engineers. Following liquidation of the truck company, Mr. Stegeman was identified with several passenger car distributors in Wisconsin, notably Pierce-Arrow and Rolls-Royce.

AMA Reports Employment Stable

Maximum Variation of Automotive Industry from November to April Less Than 20,000

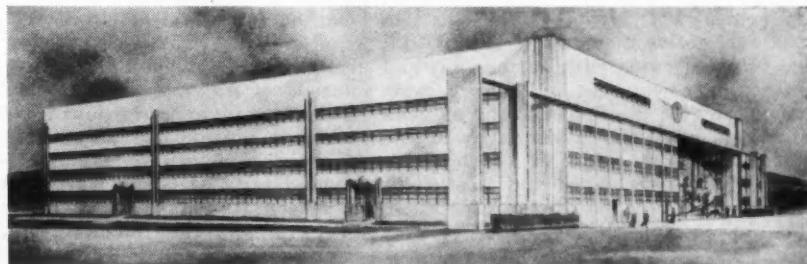
Wide fluctuation of employment in motor assembly plants, one of the major problems faced by the industry in recent years, has been eliminated this spring, the Automobile Manufacturers Association announced this week.

Reports covering the first six months of 1936-model production show that, in contrast to the large swings in the number of men at work from month to month during recent spring seasons, the industry cut down the maximum variation of employment from last November, when production got well under way, through April, to less than 20,000 from highest point of employment to the lowest.

As a result, the average earnings of more than 350,000 workers moved into new high ground for recent years; the proportion of temporary jobs has been greatly reduced; and plant efficiency has been high, with both labor turnover and factory accident rates curtailed to a marked degree.

An important aspect of this year's record, however, is that the stabilization program did not eliminate fluctuation in volume of factory sales, which continued to respond in considerable measure to changes in consumer demand. The November introduction of new models brought a rush of buying which exceeded expectations of the manufacturers. Then the prolonged and severe winter restricted consumer demand for new cars. Spring weather brought a second wave of buying.

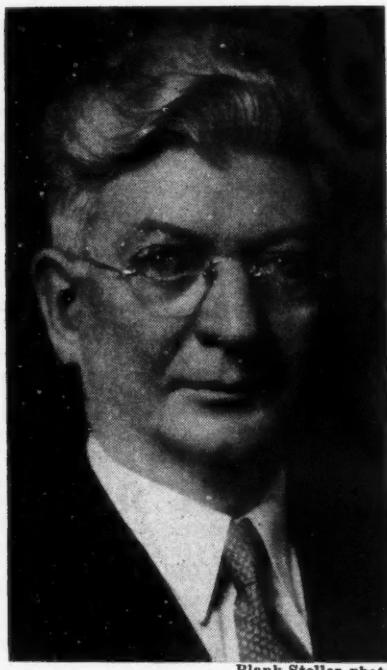
The plants kept their forces at work during dull weeks in January and February, partly by expanding the practice of producing sub-assemblies, motors, transmissions, axles and other parts in advance of need, and partly by building up field stocks of cars. As a result, increased demand for cars in March was met without raising average weekly working hours as much as had been necessary in the two preceding spring seasons.



Sketch of the huge new assembly building being constructed by the Boeing Aircraft Co. of Seattle on a 28-acre tract adjacent to Boeing Field. It will be large enough to house nine fully assembled Boeing 299 four-engined bombers. The cost will exceed \$250,000.

Borg-Warner Names Division Heads

E. C. Traner Becomes President of Mechanics Universal Joint, C. M. Kaltwasser President of Marvel



Blank-Stoller photo

Emil C. Traner
recently named president of the Mechanics Universal Joint and Rockford Drilling Machine Divisions of the Borg-Warner Corp.

C. M. Kaltwasser has been elected president of the Marvel Carburetor Co., of Flint, Mich., subsidiary of Borg-Warner Corp. Other officers elected at the annual meeting are: David Firth, vice-president and assistant general manager; D. P. Molony, vice-president; Harry Strohm, vice-president; Mathew Keck, secretary-treasurer; W. M. Piereson, assistant treasurer; U. R. Warjakka, assistant secretary.

Directors elected were: C. M. Kaltwasser, David Firth, Howard E. Blood, D. D. Francis, O. I. Larsen and G. A. Shallberg.

Mr. Kaltwasser joins the Borg-Warner organization after a long career as a manufacturing executive, 17 years of which have been spent in the automotive industry. Prior to 1917, he was associated with various gas and utility interests. In 1917 he became affiliated with the Spicer group as vice-president and general manager of the Salisburg Axle Co., of Jamestown, N. Y. In 1928, when the Spicer interests acquired the Brown-Lipe Gear Co., of Syracuse, he became general manager. In 1930 he became vice-president of Timken-Detroit Axle Co. In 1933 he became associated with the Cord organization, as executive vice-president of the New York Shipbuilding Corp. of Camden, N. J., which he will leave on June 1, to assume his



C. M. Kaltwasser
President of the Marvel Carburetor division of Borg-Warner Corp.

new duties with the Marvel company.

Emil C. Traner of Rockford, Ill., has been named president of the Mechanics Universal Joint division according to an announcement of the Borg-Warner Corp. He succeeds the late Eric Ekstrom. He will also serve as the com-

pany's general manager and treasurer.

Mr. Traner has long been identified with the automotive industry, having served as general manager for the Rockford Drilling Machine Co. since 1916. The latter concern is an important producer of automotive clutches, and in 1929 was acquired by Borg-Warner. He is also president of that division.

Motor Export Men Active on Foreign Trade Week Programs

Export officials of the automobile industry will take an active part in public meetings which will be held in various cities throughout the country in celebration of National Foreign Trade Week (May 17-23) the Automobile Manufacturers Association announced this week.

Edgar W. Smith, vice-president of General Motors Export Co., representing the association's export committee, will speak on the subject "Foreign Trade and Domestic Welfare" at a meeting of the St. Louis Chamber of Commerce on May 22.

Richard May, manager of planning and control, General Motors Export Co., will address a special meeting at Providence, R. I., May 18, sponsored by the Chamber of Commerce of that city. Mr. May, who recently returned from Japan where he served as managing director of General Motors Japan, Ltd., at Osaka, will also address the Foreign Traders Association of Philadelphia on May 21.

The manager of the association's export department, George F. Bauer, is now on a lecture tour through mid-western States in an effort to popularize support for the reciprocal trade agreements policy. During Foreign Trade Week, he will address meetings in the following cities: South Bend, Ind.; Chicago, Ill.; Kenosha and Milwaukee, Wis.; Minneapolis, Minn.; and Des Moines, Iowa.

Cars Called to Judgment

In Which the Metropolitan Section, S.A.E., Tries Out the 1936 Models and Gives Its Collective Opinions

Complimenting the 1936 cars on the marked improvements in steering ease and efficiency, critically-minded members of the Metropolitan section of the Society of Automotive Engineers found their most important grievances in visibility, inside room, pitch and sidesway. The occasion was the annual proving ground tests at Glenn Curtiss Airport (Jackson Heights, N. Y.) on Tuesday, May 12, and the "off-the-record" discussion which followed at an evening session in the city.

Nearly every American make was represented among the 37 cars which checked in at the airport. The French Peugeot was the only foreign entrant, and with its 121.5-cu. in. four-cylinder

engine, 124-in. wheelbase, four independently sprung wheels and completely automatic four-speed transmission caused many an American car to look to its laurels.

The course, mapped over approximately three miles of roads adjacent to the airport, included short straightaways on gravel and paved surfaces, a hairpin turn, several small hills, and a rough stretch replete with foot-deep chuck holes and deserted trolley tracks. Each S.A.E. member could drive the course at will and for each trip the driver or passenger was requested to fill in a demonstration questionnaire. Unfortunately the returns were so great that the committee was swamped

and only a very general summary is as yet available.

Results of the exhaust gas analysis conducted under the direction of F. H. Dutcher proved one of the most interesting features of the evening session. Tests were made idling, at 25 m.p.h. up hill, and cruising, and the results recorded in percentage of perfect combustion.

At idling, 23 cars showed less than 70 per cent efficiency, 13 cars were classed between 71 and 80 per cent, and only one, better than 80 per cent.

The second test, up hill at 25 m.p.h., showed seven cars below 70 per cent, 27 cars between 71 and 85 per cent, and three cars above 85 per cent. Cruising on level ground only one car was below 70 per cent, eight cars were between 71 and 85 per cent, and 27 cars were above 85. One approached 95 per cent efficiency in this classification.

The only other mechanical device used in the testing was the Integrating Accelerometer operated by Russell Howe of the Firestone Tire and Rubber Co. Unfortunately, traffic on the course prohibited constant speeds and therefore accurate results, and the recordings were not made public.

Under the leadership of Joseph Anglada, discussion centered around accessibility. Why must a battery be under the seat, why not standardized, more accessible seat controls, why not bumper jacks as original equipment, and why not a side-mounted spare tire in the baggage compartment, were some of the more important questions asked. Door handles and window controls so close together that they could be easily mistaken were cited as important safety hazards, and a gear shift lever that extends 6 in. over the seat received criticism from many quarters.

Merill Horine, who had specialized in steering tests, led the discussion on controls. Steering generally was reported excellent, though the high-gear ratios bring parking trouble in their wake. Praise was forthcoming for the increase in space to the left of the clutch pedal and for the convenience of the almost universal foot dimmer control, though headlight control on the dash left much to be desired in some cases from the standpoint of accessibility. Brakes were reported

generally good, although there was much difference of opinion among those who had made stopping tests, and the subject of whether or not the hand brake should have dynamic as well as parking ability lead to some discussion.

Lack of vision forward and rear were the outstanding criticisms brought out in the discussion of interiors, which was lead by Herbert Chase, chairman of the proceedings. In this connection Erving Gurney made public tests which he had conducted during the afternoon in which the distance from the front of the car to the nearest point on the road visible to the driver (in normal position) was measured. Distances for the same car with different drivers varied in one case from 26 to 52 ft. The shortest distance reported by any driver was 17 ft., the longest 56 ft., and the average for all cars and drivers was 31.9 ft.

Width of front posts varied from 3 1/4 to 5 in. and the report showed no improvement, in some cases a definite regression from the previous models. Visibility to the rear, though not recorded, was reported inferior in many instances.

Position of the driver's seat with regard to both vision and comfort received severe criticism, and adequate ventilation was found definitely lacking. An interesting comment by Mr. Chase pointed out that the interior designers had not used their full oppor-

tunity to employ art to create the illusions of greater distances inside the body.

Summing up the results of the questionnaire, tabulated as far as possible in the short time available, Harold Blanchard noted that no car had been accorded an outstanding rating, that four were reported outstanding-to-good, 19 cars as good and 11 as good-to-average. Only one was reported average. Although pitch and side-sway were among the most frequent criticisms, Mr. Blanchard reported that, generally speaking, the first seven questions of the questionnaire were markedly higher in ranking than were the remaining questions.

Coming Motor Fuels

Kishline Gives Views at Dearborn Meeting, Non-Commital on Alcohol

"Lower gum and oxide deposits resulting from combustion, no higher vapor pressure, and a flatter distillation curve than present prevalent gasolines, as well as 78 to 80 octane rating," are the desired attributes of "Coming Motor Fuels" according to Floyd F. Kishline, chief engineer of the Graham-Paige Motors Corp.

Speaking before the Wednesday morning session of the Second Dearborn Conference of Agriculture, Industry and Science, held May 12 to 14, Mr. Kishline stated his belief that the majority of engineers were not in sympathy with the criticism often directed at refiners when difficulties in operation were apparently traceable to fuel causes. But what the engineer is interested in is the kinds of fuel commercially possible, whether through improved refining or alcohol blending, estimates of the probable availability including natural supply, and the performance characteristics which he can expect.

Citing concrete examples of the improved efficiency in both automotive and air craft motors, through both increased compression ratios and the use of higher octane fuels, the speaker stated his belief that engine designers were ready to keep pace with the increase in fuel performance. "The mechanical limitations in increasing compression ratios such as valves, spark plugs, pistons, piston rings, cylinder heads and gaskets have already been largely overcome, and I repeat we are ready for fuel."

Much interest was also created by the speeches of F. P. Garvan, president, and W. W. Buffum, treasurer of the Chemical Foundation, on the development of alcohol blends to date.

George M. Seaman

George M. Seaman, president of Seaman Paper Co., died in his home, 222 East Chestnut Street, Chicago, Monday. The Seaman Paper Co. operates an automotive division which manufactures Seapak and insulating materials for auto bodies.

Form Used at Met Section Tests

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

General business last week remained at about the same level as in the preceding week, which was the highest for any week in almost six years. This favorable showing was made despite the fact that there was a seasonal falling off in several lines of production. Despite unfavorable weather, one estimate places retail sales at levels from 4 to 8 per cent above those in the corresponding period last year; and the improvement was enjoyed by practically all sections of the country. A continued rise in retail sales is anticipated in May, although the retail movement is not expected to show as great an increase above the corresponding period last year as in April.

Carloadings Continue to Rise

Railway freight loadings during the week ended May 2 amounted to 671,154 cars, which marks a gain of 4973 cars above those in the preceding week, a rise of 102,227 cars above those a year ago, and an increase of 65,908 cars above those two years ago.

Employment and Payrolls Higher

Wide gains in employment and payrolls in manufacturing and non-manufacturing industries in the United States were made in March, according to the Bureau of Labor Statistics. The industries covered reported an increase in employment amounting to about 225,000 during that month, and weekly payrolls

were almost \$10,000,000 larger. Some industrial activity was curtailed by the floods, but there was a general expansion in those areas not affected.

Lumber Output Best This Year

Production of lumber during the week ended April 25 was 67 per cent of the 1929 weekly average. Production and new business were slightly above the levels in the preceding week, while shipments declined 3 per cent. Production was the heaviest reported for any week this year.

Crude Production Steady

Average daily crude oil production for the week ended May 2 amounted to 2,918,450 bbl., against 2,932,700 bbl. the week before and 2,494,100 bbl. for a year ago.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended May 9 stood at 81.6 as against 82.2 the week before and 82.5 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended May 6 showed no changes in holdings of discounted bills, bills bought in the open market, and government securities. Money in circulation increased \$53,000,000 and the monetary gold stock rose \$27,000,000.

the two countries as to prejudice the industries or commerce of either country, the country concerned may propose negotiations for the modification of the agreement or terminate it in its entirety on 30 days' notice.

In addition, the so-called "import turnover tax" on American products, which heretofore has been 6 per cent for the most finished manufactures and 4 per cent for most semi-manufactures, will be reduced to 2 per cent, the rate applied on domestic sales of similar French products. Tractors, however, are not subject to the ordinary import tax but to a special rate applying equally to all foreign tractors and to domestic tractors.

Johnson Returns to Aviation Industry as Boeing Director

Philip G. Johnson, widely known in the aviation industry, and Paul Pigott, Seattle business man, were named new directors of both the Boeing Airplane Co. and its subsidiary, the Boeing Aircraft Co., at an annual meeting of stockholders held in Seattle recently. Mr. Johnson, now vice-president in charge of production of the Kenworth Motor Truck Corp., Seattle, was president of the Boeing plant from 1926 to 1933. Pigott is president of the Pacific Car & Foundry Co.

Directors reelected include William M. Allen, Harold E. Bowman, Gardner W. Carr, Claire L. Egtvedt, Charles N. Monteith, Dietrich Schmitz and Fred P. Laudan, all of Seattle.

Astaire to Go on Packard Weekly Program This Fall

Fred Astaire, musical comedy headliner of stage and screen, will be heard in a weekly series under the sponsorship of the Packard Motor Co., starting this autumn. Details concerning the time and network on which the programs will be broadcast will be announced as soon as negotiations are completed.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

The H. Mueller Mfg. Co., Decatur, Ill., are members of the American Water Works Association which holds its annual convention at Indianapolis, so they have hit upon the rather novel plan of journeying in their motor carriage from Decatur to Indianapolis and placing it on exhibition during the convention.

They will leave Decatur on May 24 at 6 a. m. and expect to reach Indianapolis a little after 3 p. m. on the following day. The distance is nearly 180 miles.—From *The Horseless Age*, May, 1896.

New Trade Treaty Made With France

(Continued from page 680)

cessories in 1935 amounted to 57,300,000 francs (\$3,800,000).

Provisions of the trade agreement become effective June 15, this year, and will continue until July 1, 1937, and indefinitely thereafter until six months after notice of termination has been given by either country, subject under exceptional conditions to modification or earlier termination. The agreement is the first comprehensive trade agreement made with France in over a century. By the agreement the United States is assured that, with few unimportant exceptions, it will enjoy the most favorable treatment which France now, or hereafter, accords to any country, thus removing the discrimination against the United States which has

heretofore existed with respect to a large number of commodities, including American automotive products.

The supplementary quota for tractors was increased to 2300 quintals. The duty on spark plugs was reduced from 3.20 francs to 2.85 francs each while the duty on insulating parts for spark plugs was cut from 2.80 to 2.50 francs each.

American exports to France in 1935 of passenger automobiles with bodies, complete or not, were valued at 8,902,000 francs; chassis without bodies, to be subject to reduced duties, 3,658,000 francs; bodies and parts, fitted or not, 9,936,000 francs; and automobile parts and accessories under quota, 10,604,000 francs.

One of the most important of the administrative provisions of the agreement calls for the anchoring of exchange. The agreement provides that if there should be so wide a change in the relative value of the currencies of



1. Austria shows military attaches of Germany, Hungary and Italy her new armored light artillery cars.



2. Germany's new two-man tanks parade before Hitler in honor of his 47th birthday.

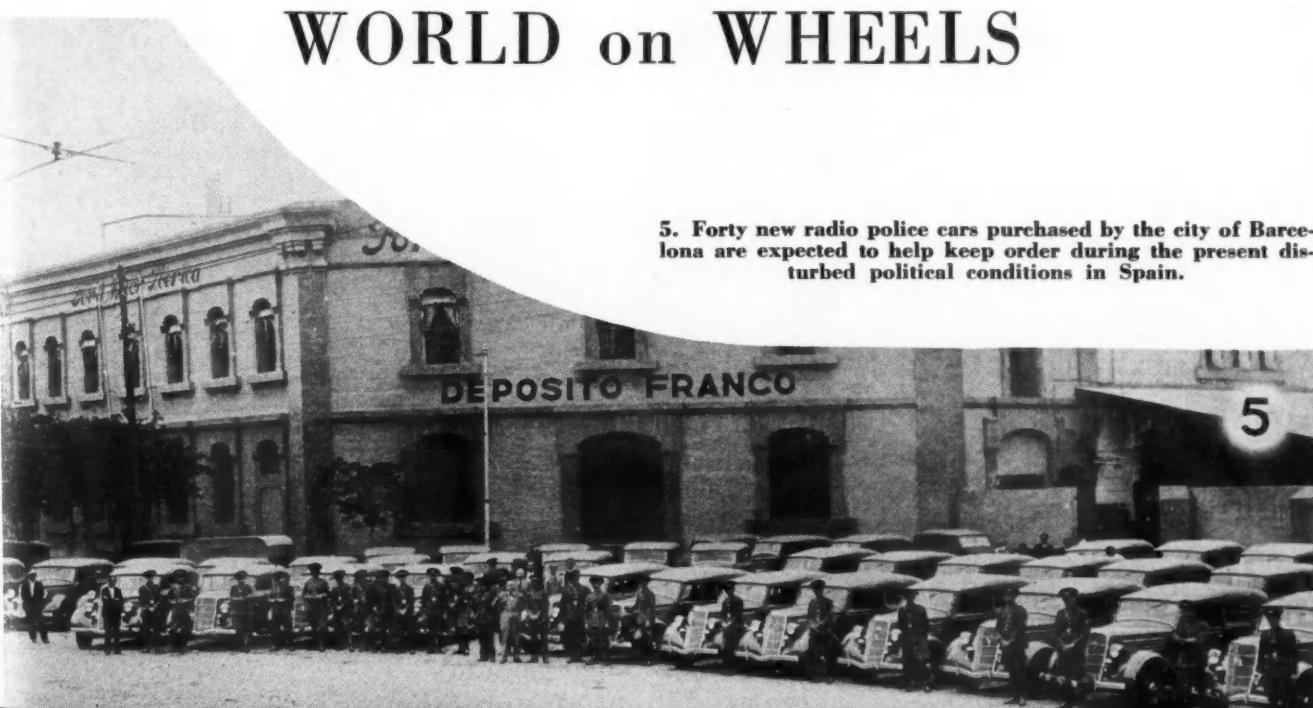


3. Spring army maneuvers in Austria bring out the latest in field artillery tractors.



4. Germany's new high-speed armored cars are shown in Berlin.

The WORLD on WHEELS



5. Forty new radio police cars purchased by the city of Barcelona are expected to help keep order during the present disturbed political conditions in Spain.

Acme and European photos.

Air Line Develops Robot Landing

Directional Radio Beams Take Over Plane's Controls Near Airport in United Air Lines' Experiments

United Air Lines' experiments with robot pilots for landing big transport ships have been successful in more than 250 tests, according to W. A. Patterson, president of the company. The tests have been made during the past four years at the Oakland, Cal., municipal airport.

Mr. Patterson explains that the system consists of special radio beams. One of these beams is a directional beam sent out by a special transmitter operating on 232 kilocycles. This is a runway marker beam which is narrow, being only 5 ft. wide at the landing circle at the middle of the Oakland airport and only 10 ft. in width at the field boundary.

The second signal is the landing beam sent out from a transmitter operating on 93,000 kilocycles. This is a beam conforming to the normal gliding path of a transport plane. This beam is transmitted along the runway, gradually projecting upward until it is 60 ft. above the ground at the border of the field.

A special antenna is used on the nose of the plane for reception of these signals. On its instrument panel is a special device which has two needles, one vertical and the other horizontal, operated by electrical impulses from the directional and landing beam stations. The vertical needle registers the location of the plane with respect to the runway marker beam, while the horizontal indicator records the position with respect to the curved landing beam.

The procedure followed by United Air Lines is for the human pilot preparing for an automatic landing to intercept the landing and runway beams at an elevation of approximately 1000 ft. at a distance of 5 miles from the airport. Maneuvering the plane so that the horizontal and vertical pointers indicate the plane is exactly on a dead center with the landing and runway beams, the pilot throttles the plane down to a speed of approximately 80 m.p.h. and then turns control of the plane over to the automatic pilot. He takes his hands and feet off the controls and concentrates his attention on the instrument with the two pointers. The only aid the human pilot is required to give is the occasional adjustment of a knob on the automatic pilot control when the needles indicated that the plane was deviating from the exact landing paths.

Telling about the tests, Mr. Patterson declared that though the experiments have been highly successful, United Air Lines will continue perfecting the system to a maximum of efficiency before making any commercial applications. He says it will probably be several years before it is applied to their regular services.

Mr. Patterson says that one noticeable thing about robot landing is that planes are landed so smoothly that observers are scarcely able to tell when the wheels touch the ground. "Human pilots apparently have a tendency to over-control in making instrument landings," said Mr. Patterson, "while the automatic pilot insures precision landings by maintaining horizontal equilibrium at all times and also by keeping the plane traveling in a straight line on the ground until the full stop is made."

Akron Labor Unrest Pushes Factories' Decentralization

With production schedules in Akron's major tire plants seriously interfered with by almost daily sit-down strikes of employees in various departments and with tire manufacturers speeding their plans to decentralize the Akron tire industry because of continued labor strife, leaders of the United Rubberworkers Union of America on Monday, May 12, started what they declared to be a determined move to curb unsanctioned sit-downs of tire builders and rubber workers.

The union action followed a series of sit-downs which resulted in the injury

of six Goodyear employees when shots were fired to disperse a crowd gathered at one of the factory gates during a midnight shift change. It also followed a sit-down of several hundred Firestone truck tire builders which resulted in the truck tire department being closed down from May 7 to May 12.

Officers and committeemen of all Akron rubber workers' local unions will be called to a meeting to receive instructions and advice on exact provisions of the international union's constitution as it concerns stoppage of work, according to Sherman H. Dalrymple, international president.

"Our by-laws and constitution definitely state what course is to be followed when there is a grievance. Violators may be dismissed from membership in the union," stated Dalrymple.

The labor flare-ups at Goodyear and Firestone followed 5 to 10 per cent wage increases given production employees by these companies as well as General and Goodrich on May 5.

Due to the continued labor strife these manufacturers are pushing decentralization plans. Goodyear, Goodrich and Firestone have transferred much mold equipment to their California factories. Goodyear has increased production in its Gadsden, Ala., plant to 8000 tires per day and is reported to have leased the Hupp plant in Detroit for warehousing and manufacturing purposes.

Ford Raises Discount

(Continued from page 679)

Ford in January is continued. This bonus affects dealers selling more than 100 cars annually and amounts to \$8 on 101 to 300 cars, \$10 on 301 to 500, and \$12 on 501 or more cars.

This discount change is the first since Feb. 6, 1931, when the 22 per cent rate was established. The flat rate followed a sliding scale schedule ranging from 17½ to 21 per cent which first became effective in May, 1930, and which was revised in detail in January, 1931, the effect of the revision being to make the higher discount rates effective at lower volume levels. This sliding scale discount in turn followed a 17½ per cent flat rate introduced in November, 1929. Prior to that date, a flat 20 per cent rate applied since the introduction of the Model A.

Hupp Suit Ended

(Continued from page 679)

Since Mr. Drum's retirement he has served as executive vice-president.

The United States Court of Appeals in Cincinnati last week upheld the opinion of Judge Arthur J. Tuttle that contracts entered into between Archie M. Andrews, former chairman of the corporation were "unconscionable and fraudulent." "The decision will have a very salutary effect on the corporation," stated Alex J. Grosbeck, a director. "We expect to arrange for new working capital without difficulty."



The special antenna installed on the United Air Lines' experimental Boeing transport receives the two directive beam signals which operate the automatic landing apparatus

Earnings Statements of Automotive Companies

	1st Quarter 1936	1st Quarter 1935
Auburn Automobile Co.	\$703,564*	\$451,597*
Reo Motor Car Co.	195,266*	10,620
Boeing Airplane Co.	41,469*	213,262*
United Aircraft Corp.	350,952	75,516
Warner Aircraft Corp.	15,953	24,263
Black & Decker Mfg. Co.†	364,041	140,599
Continental-Diamond Fibre Co.	45,719	15,214
Marlin-Rockwell Corp.	245,063	190,154
Motor Wheel Corp.	370,014	258,124
Thompson Products, Inc.	218,520	150,083

*Net Loss. † 6 Months ending March 31.

Earle V. Hennecke

Earle V. Hennecke, active in the automotive industry since 1902, died on May 11. His varied business connections, always acting as sales executive, included the National Lamp Works, Johns-Manville, American Eveready Co., the Moto Meter Co., R. M. Hollingshead Co., Earle V. Hennecke, Inc., and the Copper Corp.

Mr. Hennecke lived at Flushing, L. I., where he was active in golf and water sports. He is survived by his widow, five brothers and a sister.



GEORGE W. OTTO has been appointed service promotion manager for the Cadillac Motor Car Co.

H. M. GOLDOFF has been named Cadillac parts and accessory manager.

S. A. JEFFRIES has been appointed chief truck engineer of the Studebaker Corp. according to an announcement by D. G. Roos, vice-president in charge of engineering. Mr. Jeffries comes to Studebaker after serving for a number of years as chief engineer of the Reo Motor Co., truck division.

CHARLES T. SCANNELL, general manufacturing manager of the Buick Motor Co., was guest of honor at a testimonial dinner May 8 marking his 30th anniversary with the company. The dinner, presided over by Harlow H. Curtice, president, was attended by executives of all Buick manufacturing divisions and the entire factory field executive personnel.

GEORGE A. SMART, tool engineer of the Allis-Chalmers Mfg. Co., Milwaukee, has been elected chairman of the newly organized Milwaukee chapter of the American Society of Tool Engineers.

L. W. GROTHAUSE, since 1932 assistant to the president of Allis-Chalmers Mfg. Co., and with the company for the past 30 years, has been elected a vice-president.

LEE R. McCULLOUGH, for the past two years western advertising representative of Chilton Co., has joined the staff of Klau-Van Pietsch-Dunlap Associates, Inc., with headquarters in that organization's Chicago office.

GROVER THOMPSON has been appointed regional manager in charge of wholesale sales in the Dallas territory of the Studebaker Corp. Mr. Thompson is one of Studebaker's oldest executives, having

joined the company in 1912, less than a year after its incorporation. He was with the horse-drawn vehicle division until it was discontinued in 1920.

New Cars Equipped With Spare Tires Bring Dealer Complaint

Complaint on the part of independent tire dealers against the practice of automobile manufacturers furnishing spare tires on new cars will be aired at the trade practice conference to be held in Chicago, June 4, by the Federal Trade Commission, it is reported.

It was formerly the practice for local automobile dealers to buy spares from local tire dealers at a discount. Dealers complain that for the past few years car factories have been buying spares direct from tire manufacturers at even greater discounts and forcing them to take them on separate invoices at wide mark-ups. When the car buyer insists on having his car equipped with special tires, the dealer has to dispose of the standard shoes, usually at a loss. Formerly he could use the four standard shoes as spares on four other cars, but is no longer able to do so since all cars come equipped with five tires.

In preparation for the trade practice conference of tire manufacturers, independent dealers and mass distributors, the National Association of Independent Tire Dealers is staging a series of State dealer rallies and has named five state directors. They are Howard J. Sunderland of Baltimore, Md., Mervin Williams of Gadsden, Ala., U. S. Grant of San Diego, Calif., J. T. Linnehan of Boston, Mass., and David Lehman of Washington, D. C.

New-Car Sales Data Opposed

Some Dealers Would Eliminate Them to Prevent Factory Pressure

Automobile dealers in several parts of the United States are opposing actively the compilation of new-car registration figures, on the grounds that publication of such figures causes automobile manufacturers to bring undue pressure to bear on dealers to obtain a certain percentage of sales in their price class. Some dealers feel, apparently, that they would benefit if

May Presses Hard on April for Year's Production Peak

(Continued from page 679)

April retail deliveries of Studebaker cars totaled 10,053 representing an increase of 63 per cent over the same month last year and higher than any month since June, 1929. Sales for the first four months are 54 per cent above last year.

Sales of the Twin Coach Corp. were 60 per cent ahead of last year for the first four months, the company reported this week. The largest April order was for a fleet of 25 trolley buses, valued at \$350,000, for the Youngstown Municipal Railway. The company has recently introduced a 45-passenger aluminum trolley bus, said to be the first single-motor unit of the kind in the United States.

The Netherlands Orders 13 Planes from Martin

An order for 13 planes valued at \$1,500,000 has been placed with the Glenn L. Martin Co. by the Netherlands Government, according to press reports. The first ship is to be ready for delivery Aug. 1 and the remaining 12 are to be finished during August and September.

Charles Brink

Charles Brink, former plant superintendent of the old W. K. Prudden Wheel Co. and later of the Motor Wheel Corp., of Detroit, died last week at St. Petersburg, Fla. Mr. Brink was a pioneer of the automotive wheel-making industry, having started with the late W. K. Prudden when his company was formed. Funeral services were held at Lansing Wednesday.

Studebaker Signed 110 New Dealers in April

One hundred and ten new Studebaker dealers were appointed during April, according to George D. Keller, vice-president in charge of sales, the Studebaker Corp.

the statistics were discontinued.

In Wisconsin, the Automotive Trades Association is reported to be polling dealers on whether they want the Secretary of State to cease issuing the data. The early returns in the poll are said to favor eliminating registration information. Manufacturers are reported to be opposing the move for discontinuance.

1935 Car Selling Trends by Zones

	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific	U. S. Total
Number of Dealers Reporting.....	77	238	248	182	84	32	77	214	175	1,327
New Cars Sold at Retail.....	12,906	48,059	48,687	24,595	19,086	6,466	21,987	26,496	41,310	249,592
New Cars Sold on Installment.....	6,873	26,818	29,119	14,077	11,647	3,809	13,227	14,915	24,251	144,736
Used Cars Sold at Retail.....	19,624	71,236	75,974	45,299	30,805	12,406	38,260	40,769	59,407	393,780
Used Cars Sold on Installment.....	11,331	42,472	48,633	27,027	20,490	8,111	25,027	26,481	36,953	246,525
Used Cars Junked.....	2,358	7,263	8,650	3,946	2,846	966	3,536	3,028	5,643	38,236
Used Cars Traded on New Car Sales.....	11,489	41,731	41,307	21,326	15,899	5,295	18,443	22,219	33,891	211,600
Used Cars Traded on Used Car Sales.....	10,124	39,270	43,949	24,552	17,181	7,139	21,343	22,507	30,648	216,713
Total Used Cars Bought.....	21,613	81,001	85,256	45,878	33,080	12,434	39,786	44,726	64,539	428,313
Average New Car Sales per Dealer.....	168	202	196	135	227	202	286	124	236	188
Average Used Car Sales per Dealer.....	255	299	306	249	366	388	497	191	339	297
Average Used Cars Bought per Dealer.....	281	340	344	252	394	389	517	209	369	323
Percentage Sold on Installment:										
New Cars.....	53.3	55.8	59.8	57.2	61.0	58.9	60.2	56.3	58.7	58.0
Used Cars.....	57.7	59.6	64.0	59.7	66.5	65.4	65.4	65.0	62.2	62.6
All Cars.....	56.0	58.1	62.4	58.8	64.4	63.2	63.5	61.5	60.8	60.8
Percentage of Trade-ins and U. C. Sales:										
Trade-ins on Sales of New Cars.....	89.0	86.8	84.8	86.7	83.3	81.9	83.9	83.9	82.0	84.8
Trade-ins on Sales of Used Cars.....	51.6	55.1	57.8	54.2	55.8	57.5	55.8	55.2	51.6	55.0
Total Trade-ins in per cent of New Cars Sold.....	167.5	168.5	175.1	186.5	173.3	192.3	181.0	168.8	156.2	171.6
Used Cars Sold in per cent of New Cars Sold.....	170.3	163.3	173.8	200.2	176.3	206.8	190.1	165.3	157.5	173.1
Used Cars Junked in per cent of Total Trade-ins.....	10.9	9.0	10.1	8.6	8.6	7.8	8.9	6.8	8.7	8.9
Inventories:										
New Cars on Hand 1/1.....	740	2,390	2,375	1,264	994	271	889	1,211	1,881	12,015
New Cars on Hand 12/31.....	1,403	4,856	4,599	2,750	2,273	737	2,306	2,610	4,087	25,621
Used Cars on Hand 1/1.....	1,844	6,771	6,337	3,612	2,664	1,020	2,975	3,243	4,695	33,161
Used Cars on Hand 12/31.....	2,507	10,256	10,068	5,175	3,734	1,347	4,035	5,015	7,178	49,315
Per Cent Change New Car Inventory.....	+89.6	+103.2	+93.6	+117.6	+128.7	+172.0	+159.4	+115.5	+117.3	+113.2
Per Cent Change Used Car Inventory.....	+36.0	+51.5	+58.9	+43.3	+40.2	+32.1	+35.6	+54.6	+52.9	+48.7

New England—Conn., Me., Mass., N. H., R. I., Vt.
Middle Atlantic—N. J., N. Y., Penna.
East North Central—Ill., Ind., Mich., Ohio, Wis.

West North Central—Ia., Kans., Minn., Mo., Neb., N. D., S. D.
South Atlantic—Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va.
Pacific—Cal., Ore., Wash.

East South Central—Ala., Ky., Miss., Tenn.

West South Central—Ark., La., Okla., Tex.

Mountain—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.

Trade-Ins on 85% of New Cars Sold

(Continued from page 680)

28 used cars in 1935, as compared to 12.7 used cars junked in the preceding year. Used cars junked to total trade-ins in 1935 amounted to 8.9 per cent.

Introduction of new models in the fall of 1935 resulted in a big change in the inventory situation at the end of 1935. New cars on hand as of Dec. 31, were up 113.24 per cent over Jan. 1, 1935. Used car stocks also showed an increase of 48.71 per cent for the same period. Average new cars and trucks on hand per reporting dealer as of Dec. 31, 1935, were 19.3, and used car stocks averaged 37.2 per reporting dealer, or a ratio of practically 2.1. One year previous, the average new car stocks on hand per reporting dealer were 5.6, and used car stocks averaged 18.1.

The 1327 reporting dealers were from every section of the United States and represented all makes of cars. They sold 249,592 new passenger cars and trucks at retail, or approximately 8 per cent of the total 2,743,908 new cars and 510,683 new commercial vehicles registered. These reporting dealers averaged 188 new car and truck sales and 297 used cars and trucks.

Studebaker to Enlarge Its Los Angeles Plant

Stopping in Chicago last week en route to Los Angeles, Paul G. Hoffman, president of the Studebaker Corp., told a representative of AUTOMOTIVE INDUSTRIES that his company plans to enlarge its West Coast unit in Los Angeles to twice its present capacity. Work is to be started immediately, and it is ex-

pected that the addition will be put into service late in the summer.

The present plant, which was completed a little less than a year ago, is operating at capacity, turning out 55 cars a day. Enlarged facilities will bring production up to 100 cars.

Mr. Hoffman explained that the original purpose of the West Coast unit was to assemble only. It has been found advisable to do certain of the manufacturing operations, which is one of the reasons for enlarging facilities. The plant will make all of its own bodies.

Tell-Tale Light for Speeders Suggested by Swedish Inventor

Paul Danielsson, engineer of Stockholm, Sweden, has invented a speed indicator to be placed on top of automobiles so that traffic law violators can be detected from a distance.

An electric lamp, displayed above the windshield, shows white at 30 kilometers an hour. At a higher speed the light gradually turns green, and at 60 kilometers an hour or over it flares bright red.

New High for GM April Sales

World Shipments Totaled 229,467; U. S. Consumer Sales Over 200,000, a Gain of 15% Over 1929 Month

While General Motors' April factory shipments to dealers throughout the world were eking out a narrow margin above the peak established in 1929, sales to United States consumers left no doubt as to the new record which was being set up.

World shipments for April of this year totaled 229,467 units, a gain of 25 per cent over the same month in 1935 and 1745 units above the 1929 figure.

Sales for the month this year to U. S. consumers totaled 200,117 units, a gain of nearly 39 per cent over the 143,909 sold in 1935, and 15 per cent

over the 1929 peak of 173,201 units.

A comparison of the first four months figures shows substantial gains in wholesale and retail sales, both foreign and domestic. The sharply lowered position of dealers' stocks is indicated by the fact that this year only 24,942 more cars have been sold to dealers during the first four months than have been sold at retail, whereas in the same period last year, this differential amounted to 52,200 units.

The accompanying table shows General Motors' sales for April contrasted with the previous month and with April, 1935.

	April, 1936	March, 1936	April, 1935	1936	1935
Sales to world dealers.....	229,467	196,721	184,059	729,634	572,775
Sales to U. S. dealers.....	194,695	162,418	152,946	605,009	454,202
Sales to U. S. consumers....	200,117	181,782	143,909	580,067	402,002
Change in U. S. dealer stocks —	5,422	— 19,364	+ 9,037	+ 24,942	+ 52,200
Sales to foreign dealers.....	34,772	34,303	31,113	124,625	118,573

Automotive Metal Markets

Steel Men Differ in Opinions as to Likelihood of Price Advance Rumored in Wall Street

By way of Wall Street, predictions of a \$2 to \$3 per ton boost in third-quarter steel prices found their way into the steel market this week. The ticker prophecy came in for varying comment in the trade.

There are those producers who have held right along that conditions justify more of an advance than was attained in the second quarter through the elimination of concessions and the introduction of quantity differentials. These now point out that the certainty of higher labor costs as the result of Social Security Act provisions and voluntary payroll increases make further upward revision of selling prices an immediate necessity.

Other producers are just as staunch in their defense of a policy of letting well enough alone at this time, so as not to jeopardize volume of demand. And then there are those who consider it good market strategy to talk higher prices at the first sign of lessened demand, so as to stimulate protective covering at going prices.

Rolling mills have now completed shipments against obligations at first-quarter concession prices. While most of them have a fair volume of specifications coming in from day to day, backlogs, except in the case of automobile sheets, are being more and more reduced. So as to afford finishing mills ample time to turn out automobile sheets, rather than with a view to a possible advance, some business has been placed for July shipment. If the customary method is followed third-quarter prices will be announced the last week of this month.

Meanwhile developments, especially those with reference to taxation and efforts to unionize the steel industry in its entirety as well as the buying pace of automotive consumers, are likely to exert unusual influence on the market's course. Ordinarily a fortnight's happenings can be anticipated and discounted, but it is not so at this stage of market developments.

Pig Iron—With water shipments from Lake Erie ports to Michigan automotive foundries under full headway, shipping is more to the front than buying, although it is reported that quite a little business was booked by blast furnace sales representatives from foundrymen who held a convention at Detroit last week. Prices are entirely unchanged.

Aluminum—A large piston manufacturer is reported to have booked a Ford contract that will insure close to capacity operation over the remainder of the year. The sole domestic producer of primary aluminum has closed the Niagara Falls fabricating unit and moved the rolling equipment to Tennessee. Both primary and secondary metal prices are unchanged.

Copper—Aside from sales by producers to their own fabricating subsidiaries, very little activity is noted in the domestic market, which holds at 9½c, delivered Connecticut. The nominal quotation in the "outside" market is 9¾c.

Tin—While London and Singapore quotations as well as the pound sterling receded,

the scarcity of spot tin in New York caused the market to be quoted ¼c higher at 46¾c at the beginning of the week.

Lead—Quiet and unchanged.

Zinc—Dull and unchanged.



"Agathon Alloy Steels" is the title of a 106 page handbook put out by the Republic Steel Corp., Youngstown, Ohio. The applications of alloy steels for specific uses in leading industries are discussed.

The No. 6 Fellows Hourglass Gear Shaper, for cutting hourglass worms is described in a circular published by The Fellows Gear Shaper Co., Springfield, Vt.

The Fansteel Metallurgical Corp., North Chicago, Ill., has issued a 48-page book on Tantalum, giving technical information about this metal.

Painting as a part of plant conditioning is discussed in the Save-Lite catalog published by The Sherwin-Williams Co., Cleveland, Ohio.

Electric and belt driven grinders and polishing machines are described in catalog No. 7 of the Clizbe Bros. Manf'g. Co., Plymouth, Ind.

New Honing Accomplishments are described in a recent circular of the Micromatic Hone Corp., Detroit.

Peter Brothers Manf'g. Co., Algonquin, Ill., describes Woodstock improved safety tapping chuck in catalog No. 35.

Power driven, horizontal duplex, double-acting, cross-head type compressors are described in a new bulletin of the Ingersoll-Rand Co., 11 Broadway, New York City. Proceedings of the Sixteenth Annual Meeting, American Petroleum Institute, Section III, Refining, includes a number of papers of automotive interest. From the office of the A.P.I., 50 W. 50th St., New York. 50 cts. per copy.

"A Rubber Plantation in New Jersey" is feature subject of Vol. 1, No. 1, Thiokol Facts Vol. 1, No. 1 published by the Thiokol Corp., Yardville, N. J. Thiokol is said to be the first commercially produced synthetic rubber in the United States. Copies available through AUTOMOTIVE INDUSTRIES.

A new pamphlet has just been issued, by the makers, on the Pratt & Whitney No. 3 Universal Bench Grinder. Applications of the machine to varied types of work are described and illustrated. Copies are available through AUTOMOTIVE INDUSTRIES.

An Air Traveller's Guide to the Nation's Greatest Playground has recently been published by United Air Lines. There are 50 illustrated pages of more than usual interest. Copies available from United Air Lines, Chicago.

R-P Brake Adjuster; a Correction

The automatic brake adjusting device described in our issue of April 18, was incorrectly referred to as the A.P. automatic brake adjuster. It should have been the R.P.

Calendar of Coming Events

SHOWS

Spain Automobile Show, Madrid,	May 10-20
International Aero Exhibition, Stockholm, Sweden	May 15-June 1
International Petroleum Exposition, Tulsa, Okla.	May 16-23
Morocco, Fair of Tangiers	May 16-24
Yugoslavia 16th International Spring Fair, Lubiana	May 30-June 11
France, Automobile Exhibit at Foire de Paris	May
Norway, Automobile Show, Oslo	May
Olympia Motor Show, London, England	Oct. 15-24
National Motor Truck Show (N. J. Motor Truck Assn.), Newark, N. J.	Nov. 3-7
National Automobile Show, Grand Central Palace, New York	Nov. 11-18
International Aviation Show, Paris, France	Nov. 13-29
Boston Automobile Show	Nov. 14-21
Columbus Automobile Show	Nov. 14-20
Chicago Automobile Show	Nov. 14-21
Detroit Automobile Show	Nov. 14-21
Washington, D. C., Automobile Show	Nov. 14-21
Cincinnati Automobile Show	Nov. 15-21
St. Louis Automobile Show	Nov. 15-22
Baltimore Automobile Show	Nov. 21-28
Brooklyn Automobile Show	Nov. 21-28*
Cleveland Automobile Show	Nov. 21-28
Kansas City Automobile Show	Nov. 21-29*
Milwaukee Automobile Show	Nov. 22-29
Peoria Automobile Show	Nov. 30-Dec. 5*
Philadelphia Automobile Show	Nov. 30-Dec. 5*

* Tentative dates.

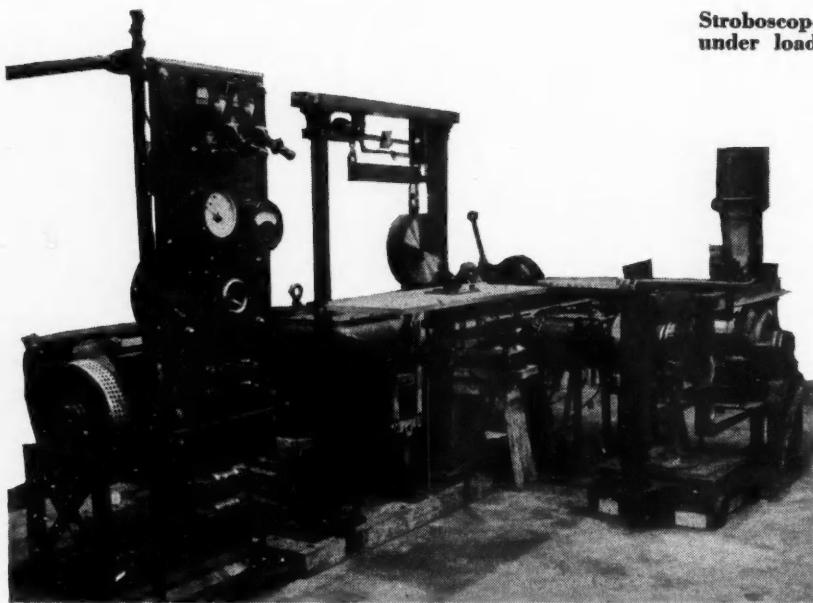
Natl. Exposition of Power & Mechanical Engineering, Biennial Meeting, New York City Nov. 30-Dec. 5

CONTESTS

500-Mile International Sweepstakes, Indianapolis May 30

CONVENTIONS AND MEETINGS

National Battery Manufacturers Association, Spring Convention, Cleveland	May 20-21
American Iron and Steel Institute, 45th General Meeting, Waldorf-Astoria Hotel, New York	May 28
S.A.E. Summer Meeting, White Sulphur Springs, W. Va.	May 31-June 6
Automotive Engine Rebuilders Assoc. Annual Convention, Cincinnati	June 1-4
National Association of Credit Men, 41st Annual Convention, Richmond, Va.	June 8-12
National Oil and Gas Power Conference, American Society of Mechanical Engineers, University of Michigan, Ann Arbor	June 24
American Society for Testing Materials, Annual Meeting, Atlantic City	June 29-July 3
National Association of Power Engineers, Annual Meeting, Chicago	Aug. 31-Sept. 4
American Transit Association, Convention, White Sulphur Springs, W. Va.	Sept. 21-24
American Society for Metals, 18th Nat'l Congress, Cleveland, O.	Oct. 19-23
American Gas Association, Annual Meeting, Atlantic City	Oct. 26-31
American Petroleum Institute, Annual Meeting, Chicago	Nov. 9-12
Natl. Industrial Traffic League, Annual Meeting, New York City	Nov. 19-20



Stroboscope set up for testing hypoid gear under load by power supplied by electric dynamometer

direct-reading dial. A small reed (120-cycle) is located in the reflector, so that the calibration can be checked and adjusted while the instrument is in use. Readings of the instrument are said to be accurate within less than 2 per cent over the entire range. The frequency of the relaxation oscillator is not seriously influenced by drifts in line-voltage, and no correction or adjustment is necessary on the dial for input voltages from about 110 to 120 volts. The flashing light source is a neon tube placed at the focus of a parabolic reflector. It has a special type of cold cathode with a low voltage drop. The cathode permits the passage of peak currents of several hundred amperes, which produce flashes of light sufficiently bright for speed measurement and for observing small objects, though, of course, the

By K. J. DEJUHASZ* and
NORMAN YOUNG, JR.**

The Stroboscope

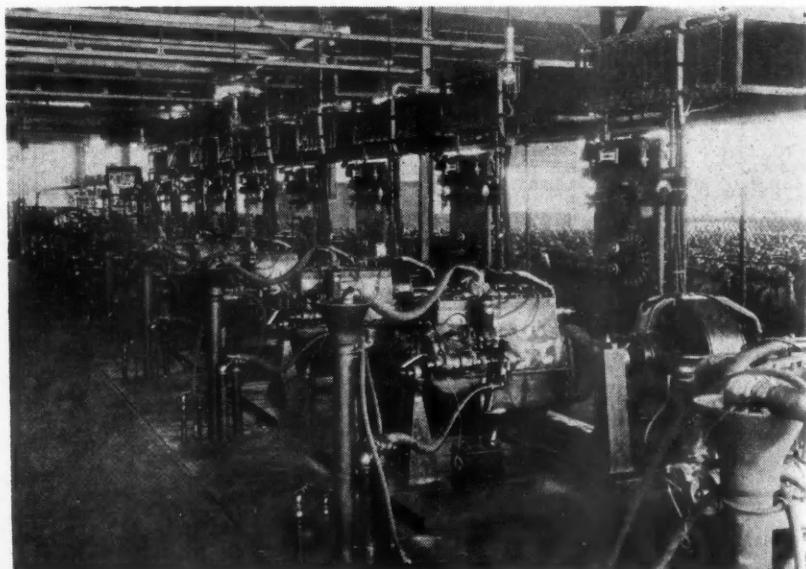
at Work in

A COMPACT and simple stroboscope intended primarily for speed measurement is the Strobotac (Fig. 11, Ref. 21) developed by Wilkins, Edgerton and Germeshausen (manufactured by General Radio Co.). This instrument is self-contained, weighs 12 lb., and requires 30 watts from a 110-volt, 60-cycle power source. The rate of flashing is controlled by an illuminated dial with two scales, 600-3600 and 2400-14,400 r.p.m. The speed-indicating dial controls the frequency of a relaxation oscillator and has a frequency variation that is nearly linear with respect to the position of the dial. Provision is made for the adjustment of the oscillator in order to match the frequency of the oscillation with the numbers on the

* The Pennsylvania State College.

** Philco Radio & Television Corp.

Space for additional equipment of the latest type is provided in the enlarged Hercules plant



Edgerton stroboscope is used for studying engine lubrication. It can be observed when and where the oil drops are thrown up by the piston—
The Pennsylvania State College

Fig. 11—(Below) Strobotac of the General Radio Co.



Part 2

Concluding an article Part 1 of
which appeared in AUTOMOTIVE
INDUSTRIES issue of May 9, 1936
on page 660

in Automotive Research

light is less than that obtainable with more powerful stroboscopes.

The latest addition to the list of neon-lamp stroboscopes is the "Stroboglow" manufactured by the Westinghouse Electric and Manufacturing Company. A heavy-duty, sign-type, cold-cathode neon lamp of inverted-U shape is used (called Type-B lamp by the manufacturers). It is stated that when discharges are made at the rate of about 1800 per minute, the momentary intensity is approximately 300,000 candle power and the duration is of the order of one one-hundredth of a second. The Stroboglow consists of three units, the power unit, the lamp, and the electronic timer, the general arrangement being similar to that of the mercury-lamp stroboscopes to be described later.

The power unit operates from a 115 volt, 50-60 cycle alternating current line, rectifies and filters the current, and supplies suitable voltages for all the stroboscope circuits.

Being connected to the power-unit box by a 10-ft. cable, the lamp unit can be readily moved by hand, and can be set up on a tripod near the object to be investigated. This contains the stroboscopic lamp itself, set up in the focus of a parabolic cylinder which distributes the light over a wide area. It also carries the electronic timer and all of the necessary flashing-speed controls, the latter within easy reach of the operator. It also contains a Type 58 amplifier tube which charges a condenser periodically. When the condenser has reached the proper poten-

tial, it causes the grid of a gas-filled timing tube (Type 885) to permit a discharge to pass through its plate circuit. This circuit includes the primary of a spark coil whose secondary lead touches the top of the stroboscopic lamp. The lamp has a filtered, direct voltage from the power unit applied to it continuously, this being the main supply of energy converted into light, but a flash is produced only when the spark coil is energized. By varying the capacity of the flashing condenser, the flashing rate can be adjusted to the frequency of the phenomenon to be investigated. Provision is made also to time the flashes by a contactor driven directly from the engine or machine being tested instead of by the electronic timer.

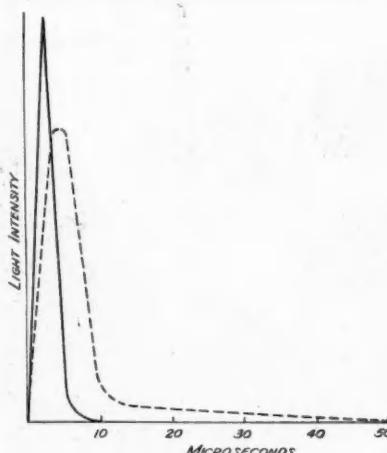


Fig. 12—Time variation of the light from a mercury tube (Edgerton) when the tube is cold (10 microsec.) and when it is hot (50 microsec.)

Neon has two advantages as a gas for the discharge tubes: It gives a very short duration of flash with practically no lag, and the reddish color gives a distinctive appearance even in daylight. On the other hand, it has the disadvantage of low actinity, i.e., the image does not photograph well and requires a long exposure.

This latter defect is eliminated by using a mercury vapor lamp as the light source, as in some commercial stroboscopes developed in recent years, including the Edgerton stroboscope (General Radio Co.), which was the first in the field, and the one marketed by the International Broadcasting Equipment Co. In view of their wide-spread use in mechanical engineering research, this group of stroboscopes will be described in considerable detail.

The mercury lamp consists of a highly evacuated glass tube (of about $\frac{1}{2}$ in. diameter and 15 in. length) bent into an inverted "U" shape, with a small pool of mercury in each of its two ends. The rest of the tube is filled only with mercury vapor, the pressure of which depends on the temperature of the mercury pool. In its non-ionized state the mercury vapor has a high resistance, but once the vapor is ionized and the current is established, the resistance drops to a low value.

In stroboscopic applications the mercury lamp forms part of a circuit containing a condenser, which latter is charged to 800-1000 volts. This, however, is not sufficient to break down the resistance of the lamp. In order to make the lamp conductive, it is necessary to ionize a portion of the mercury vapor. This is accomplished by a very high tension electrostatic field (several

thousand volts) which is impressed on the mercury pool at one terminal and on a metal band surrounding the tube a short distance (about $\frac{1}{4}$ in.) from the mercury pool. As soon as ions are formed in the tube, its resistance is broken down and the energy stored in the condenser is rapidly discharged through it, the current reaching a peak value of about 1000 amps., whereby a brilliant flash is produced.

The principle of operation of mercury-lamp stroboscopes is as follows: A considerable amount of electrical energy is stored in the condenser; this energy is discharged through the mercury lamp, and then the condenser is recharged and the cycle repeated in synchronism with the phenomenon to be investigated. The merit of the mercury lamp for stroboscopic applications lies in the high efficiency with which the electrical energy is converted into light energy and in the high actinity of the light produced (the peak intensity is estimated to be equal to that produced by about 2000 KW in incandescent lamps); in the shortness of duration of the flash (less than 10 microsec.) and in its ability to produce a high frequency of flashes. Edgerton (Ref. 18) estimates the time-variation of the flash-intensity to be as represented in Fig. 12. The effective duration is about 5 microseconds when the tube is cold, and about 10 microseconds when the tube is hot; the intense portion of the light is trailed by a dim light of comparatively long duration, but this does not affect the clarity of the stroboscopes.

Mercury-lamp stroboscopes embody three groups of elements or circuits: (1) the power supply unit whose function is to provide the energy for the operation of the lamp and for its auxiliary equipment; (2) the lamp circuit, consisting of the lamp and the elements for storing the electrical energy; (3) the timing circuit which serves as a trigger for the lamp circuit, tripping it in synchronism with the periodic phenomenon to be investigated.

The power supply unit, Fig. 13, consists of a step-up transformer N with a step-up ratio of about 20:1, which transforms the alternating current from 120 to about 2200 volts; it has also some auxiliary coils which produce the low-tension alternating current (5-15 volts) used to heat the cathode filaments of the rectifier tubes and of the thyratron; a full-wave rectifier (with rectifier tubes V_1 and V_2) which converts the high voltage alternating current into a fluctuating direct current of about half the voltage; and the filter, consisting of condensers C_a and C_b and choke A , which smooth out the fluctuations. Thus a steady direct voltage of 800-1000 volts is made available at the terminals of the power supply unit.

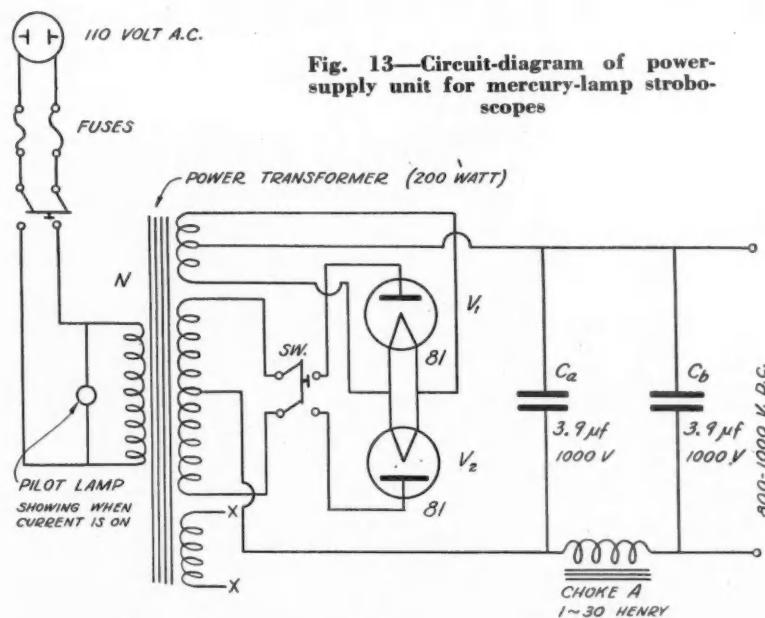
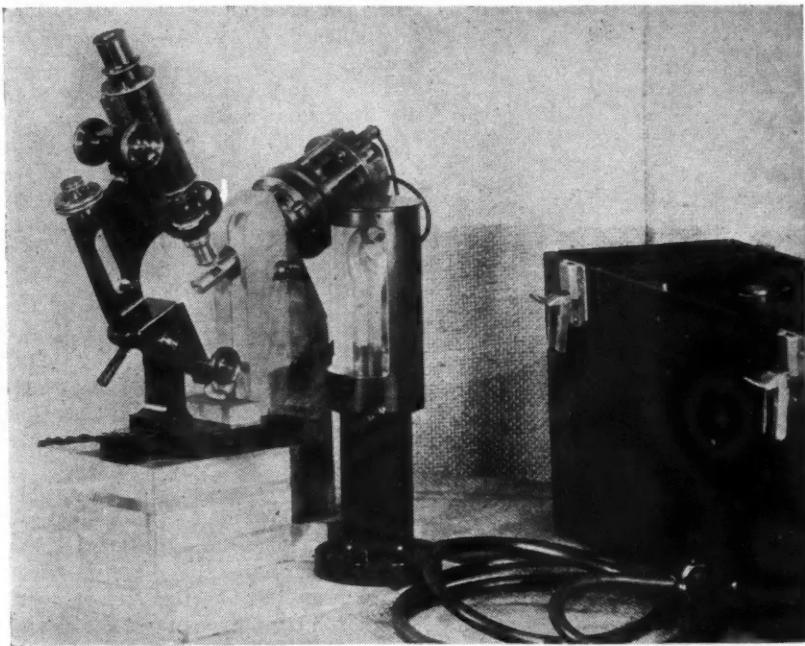


Fig. 13—Circuit-diagram of power-supply unit for mercury-lamp stroboscopes



Edgerton stroboscope and microscope used to study motion of a high speed pressure element (Commercial Engineering Laboratories, Detroit)

The lamp circuit, Figs. 14, 15, 16, consists of (1) the mercury lamp itself as described above; (2) the storage condenser C_1 , or condensers C_1' and C_1'' to store sufficient electrical energy for one flash. This condenser is charged to a potential nearly equal to that of the direct current supply. One or more condensers are used, or one variable condenser, in order to vary the capacity according to the number of flashes per second and the temperature of the tube; the greater the number of flashes, the less must be the capacity. The capacity must be made sufficiently low so that the condenser will be brought up to the rectifier-potential between flashes; but it must be high enough to store and use as much energy as possible for the flash. (3) A resistance and a choke producing a voltage drop between the power supply and the lamp when the condenser is discharged through the lamp. This voltage drop is necessary to reduce the potential at the lamp terminals after each flash, to a value low enough to extinguish the lamp quickly, otherwise a continuous light is produced instead of the desired flashes.

For the benefit of those not familiar with electrical phenomena, the role of the resistance-choke combination can be compared, very roughly, to a heavy door or valve through which the electric current must pass before reaching the storage condenser. The resistance, or, rather, its reciprocal, the conductivity, is analogous to the area of the door when it is fully open. Its presence damps out the surge of electric current

and results in a gradual charging of the condenser. The choke is analogous to the inertia of the door, determining the time in which it can be opened from the closed state, and in which it can be closed from the opened state. Owing to this inertia, an appreciable time elapses before current can pass through the door to charge the storage condenser, thus allowing the latter to fully discharge through the tube.

As the storage condenser C_1 discharges through the lamp, its potential steadily falls, until finally the lamp is extinguished because of insufficient volt-

age. The resistor R_1 and choke C_1 prevent recharging of the condenser from the supply in the short time this discharge requires. After the lamp is extinguished, the condenser is gradually recharged through the resistances in preparation for the next impulse. The circuits should be so designed and adjusted that the storage condenser is nearly fully charged during the time between impulses.

The timing circuit consists of an air-core transformer, referred to as the "impulse transformer," the secondary of which provides the high potential (between the mercury pool and the adjacent metal collar as described above) necessary to ionize the portion of the mercury vapor and thus make the tube conductive. The impulse in the secondary is produced, in turn, by current impulses in the primary coil of the impulse transformer. Closing of this primary circuit is governed by, and is in synchronism with, the periodic phenomenon to be investigated.

All commercial mercury-lamp stroboscopes use similar power supply units and lamp circuits, but they differ in the timing means employed, that is, the means producing the surge in the primary of the impulse transformer.

In the stroboscope of the International Broadcasting Equipment Company (Fig. 14, Ref. 19) the primary surge is established by discharging condenser C_2 through the primary coil of the impulse transformer whenever the trip switch is closed. Resistances R_1 and R_2 form a voltage divider, only a portion of the full supply voltage being needed for the condenser. The weak point of this arrangement is the trip switch, which has to carry considerable current when the condenser C_2 dis-

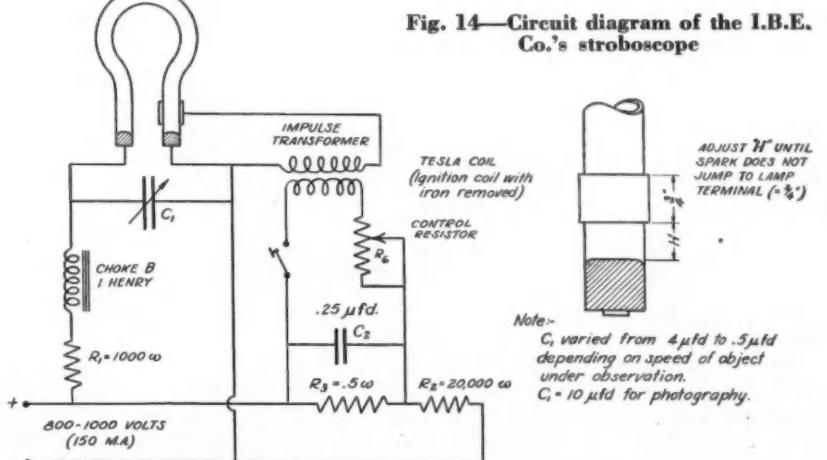


Fig. 14—Circuit diagram of the I.B.E. Co.'s stroboscope

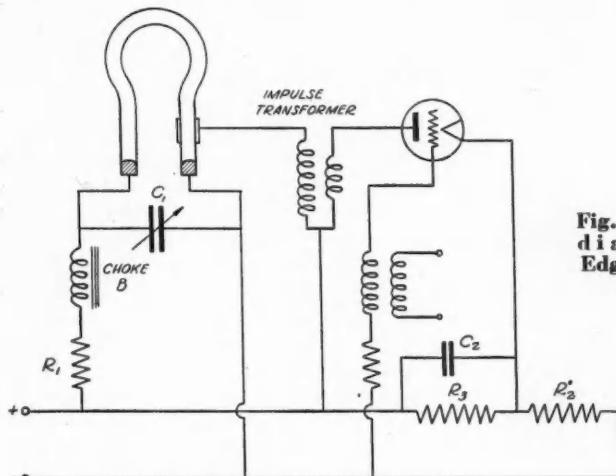


Fig. 15 — Circuit diagram of the Edgerton stroboscope

charges into the impulse transformer. Since nearly all of the current passes through the first point of contact, there is a burning of the contacts, which eventually causes flickering, missing and uncertainty of operation. This disadvantage is mitigated by using a high-ratio impulse transformer and by including a control resistor in the primary circuit, by means of which the primary timing current can be kept down to the value just sufficient to trip the flash circuit.

The Edgerton stroboscope (Fig. 15, Ref. 18) represents an important improvement, embodying a compound relay effect producing the current in the primary of the impulse transformer. Mr. Edgerton's researches did much to clear up the characteristics of the mercury lamp and to explore its industrial possibilities. The trip switch itself controls only a very minute current, which can do no harm to the contact points; this minute amount of energy actuates a thyratron tube controlling the larger primary current for the impulse transformer, the secondary voltage of which actuates the mercury-lamp.

The thyratron (Ref. 20) is an electron tube filled with mercury vapor; it contains the usual anode, heated cathode, and grid. As long as the grid potential is below a certain critical value, no current can flow between the anode and cathode. But as soon as the grid potential is raised above the critical value, the thyratron suddenly becomes conductive and can pass a large current from the anode to the cathode. Thus the thyratron acts, in effect, as a switch which is open as long as the grid is negative, but it is closed as soon as the grid potential becomes sufficiently positive. Its advantage for this particular application resides in the fact

that it can be controlled by a very minute amount of energy (grid potential), and in that it is able to pass a large current (between the anode and cathode) without any mechanical contacts or moving parts, and without deterioration of its elements.

In the Edgerton stroboscopes the thyratron acts as a switch for the flashing circuit, including the primary of the impulse transformer, the control resistor R_4 , the anode and cathode of the thyratron and the impulse condenser C_3 . This latter is charged, by means of the voltage-divider R_5-R_6 , to nearly the full potential of the rectifier. Ordinarily, however, the thyratron is non-conductive, because its grid is kept at a negative potential, being connected through resistor R_7 to the negative terminal of the power supply unit. Therefore, the circuit is open. When the thyratron is "tripped," that is, when its grid is brought up to its critical, positive po-

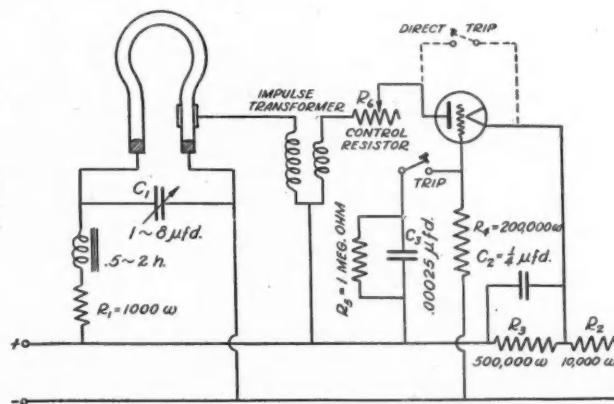
tential, it suddenly becomes conductive, the condenser C_3 discharges through the primary of the impulse transformer, and the high potential thus produced in the secondary flashes the lamp. The resistor R_4 is thus very nearly short circuited, so that the full voltage of the rectifier appears across R_6 , while the voltage across R_5 , which is applied to the plate of the thyratron, drops to a very low value. Thus the cathode is raised nearly to the potential of the anode and the grid is given a strong negative bias, which renders the thyratron non-conductive again. Therefore, the sudden flow of current to the impulse transformer will last only a very short time.

Tripping the thyratron is accomplished as follows: As stated above, owing to the resistor R_7 , the grid of the thyratron normally is sufficiently negative to keep the flashing circuit open. If, now, the tripping contacts are closed, the sudden rush of charging current into the condenser C_3 , in passing through the resistor R_4 , develops a momentary positive bias for the grid that will overbalance the negative bias due to R_7 , trip the thyratron, and produce the sequence of events described in the preceding paragraph.

It will be noted that the thyratron is tripped the very moment the contacts are closed, and that the duration of the contact is immaterial, provided resistor R_4 is sufficiently small in comparison with R_7 , so that the voltage divider R_5-R_6 does not maintain a sufficiently positive bias on the grid to continually overbalance the normal negative bias supplied by resistor R_7 . As soon as the contacts are opened, condenser C_3 discharges through R_4 , so that it will be ready to receive a new charge when the contacts are subsequently closed.

Fig. 15a illustrates another possible method of actuating the thyratron in

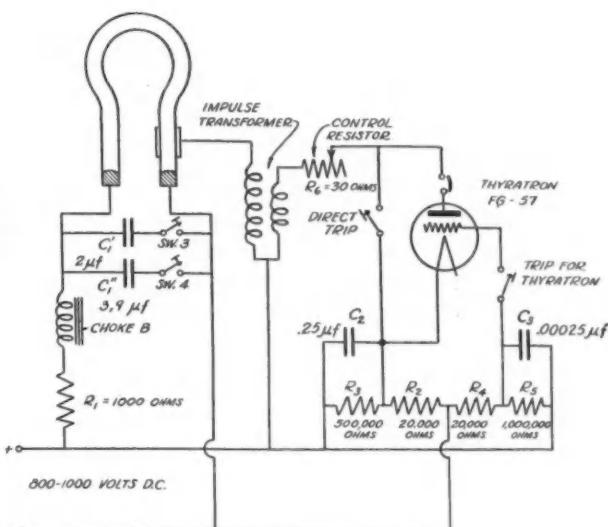
Fig. 15a — Circuit diagram of modified Edgerton stroboscope



the Edgerton stroboscope. A voltage surge from the transformer in the grid circuit causes the grid potential to exceed its critical value, thus causing the tube to conduct. This surge in the grid circuit may also be obtained by resistance- or capacity-coupling to other circuits, such as vacuum-tube amplifiers, oscillators, etc.

The mercury lamp stroboscope built by the Engineering Experiment Station of The Pennsylvania State College is of a type which can be actuated either by direct trip on the switch, or through the intermediary of the thyratron as a relay. This arrangement consists essentially of another switch shunted across the thyratron terminals, as shown for the Edgerton arrangement by the dotted lines in Fig. 14. In the actual apparatus the circuit arrangement illustrated by Fig. 16 is made use of. This stroboscope has been used with very satisfactory results in the research work on fuel-injection phenomena conducted at The Pennsylvania State College.

Fig. 16 — Circuit diagram of Penn State experimental stroboscope



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Book Reviews

Engine Bearing Loading

Engine Bearing Loading, by William Samuels, M. E. Published by Edwards Brothers, Inc., Ann Arbor, Mich.

WILLIAM SAMUELS, who is connected with the engineering staff of Chevrolet Motor Co., has developed a new method for quickly arriving at the

mean loads on the various bearings of an engine under full-throttle conditions at various operating speeds. Mean bearing loads due to gas pressures, and to inertia and centrifugal forces are determined separately. In determining the gas-pressure bearing loads it is as-

(Turn to page 708, please)

Poured to the Die—

AMONG the most important features of the 40th Annual Convention of the American Foundrymen's Association held in Detroit during the week of May 4, were a group of papers dealing with various aspects of cast alloy iron research and procedures. Brief abstracts of these papers are given below.

"Copper and Copper Manganese Gray Cast Iron" by L. W. Eastwood, Arthur E. Bousu, and C. T. Eddy, summarizes an investigation into the use of copper in cast iron which was undertaken in the regular research program of the Michigan College of Mining and Technology and, during the past year, under the cooperative research program sponsored by the Federal Emergency Relief Administration.

The Ford Motor Company, in private communication to the authors, offers corroborative information as follows on the tendency of copper to prevent chill in small sections: In chilled and gray iron "our percentages of copper vary somewhat but for the most part run from 0.75 to 1.00 per cent. The copper helps the fluidity of gray iron considerably and acts as a graphitizer. It hardens and tightens up the matrix to such an extent that the so-called 'sponginess' in gray iron is lessened. In castings where there are a number of light and somewhat heavier sections, copper aids greatly in helping (preventing) these light sections from chilling and holds a fine structure in the heavy ones *** it thus acts as a stabilizer ***".

The authors summarize the results of the investigation in the following terms:

"Extensive data have been presented on 146 compositions of gray iron containing copper as the only alloy addition. It has been demonstrated that the effect of copper is closely related to the silicon and total carbon contents, particularly to the former, thus explaining many of the contradictory statements which occur in literature on this subject.

"Similar investigations have been carried out on gray cast iron to which a copper-manganese alloy was added. About 126 compositions of such iron have been prepared approximately 100

of these have been fully tested and the resulting data reported here.

"The beneficial effects derived from the addition of copper or copper-manganese alloy to gray iron, particularly the latter, should offer a new field in gray iron production. It is hoped that the data presented here will be a guide as well as a stimulus to the use of such alloy cast iron in industry."

should recognize the importance of the elimination of stress raising notches.

Two official International exchange papers were presented—"The Heat Treatment of Cast Iron by Hardening and Tempering" by J. E. Hurst, technical director, Sheepbridge Stokes Centrifugal Castings Co., Ltd., England; and "Some Applications of Heat Treated Cast Irons in France" by Marcel Ballay and Raymond Chavy of Paris.

In the first paper, Hurst discusses, among other things, the effect of hardening, tempering, and hardening plus tempering on the strength of cast iron, and in general the influence of alloy additions, and quenching temperatures.

"The results of these investigations show that, when cast iron is subjected to hardening treatment by heating to temperatures above the A_3 critical point, and quenched in a suitable media, either water or oil, an increase in hardness accompanied by a marked drop in ultimate breaking strength, either in tension, compression, shear or transverse loading, results. The magnitude of the increase in hardness varies of course, with the chemical composition and the structural condition of the particular cast iron treated; but the increment in hardness may be over 100 per cent greater than the original "as cast" condition. In a like manner, the magnitude of the decrease in ultimate breaking strength varies according to particular conditions, but it can be of a very serious order and reductions of over 50 per cent in the ultimate strength value under conditions of transverse bending have been observed in quenched specimens.

Tempering the quench-hardened specimens is accompanied by a recovery in the ultimate breaking strength value and all the investigations show that this recovery increases uniformly with increasing temperature until a maximum is reached followed by a decline with still further increment in tempering temperature.

"Recently it has been shown that the magnitude of maximum improvement in strength results due to hardening and tempering, is to an extent dependent upon the condition, whether sand cast or chill cast, and also upon the chemical composition particularly

French and English findings supplement the many new ways presented by American investigators in the use of cast iron and its alloys.

Harry L. Daasch, associate professor in mechanical engineering at Iowa State College, presented some notes on the fatigue properties of cast iron. His conclusions based on an extensive research project are:

- (1) The endurance limit of two alloy cast irons has been determined as 18,000 and 24,000 lb. per sq. in.
- (2) The endurance ratio of these two alloy cast irons has been found to be 0.41.
- (3) The use of an endurance ratio of about 0.40 seems reasonable for high strength cast irons with slightly lower values for regular gray irons and higher values for cast steels.
- (4) A decrease of from 6 to 16 per cent has been found for a $\frac{1}{8}$ -in. radius filleted test section with a 25 per cent decrease for a 60° V-notch test bar.
- (5) Machine design practice leading toward higher strength cast metals

of advanced technique in casting gray iron, new data are presented to the 40th Annual Convention of the American Foundrymen's Association.

as regards the total carbon and silicon contents.

"Quenching from temperatures within the range of approximately 550 to 790° C. (1022 to 1454° F.) in each case is accompanied by a drop in hardness from that of the original 'as-cast' condition. From temperatures in excess of from 775 to 790° C. (1427 to 1454° F.), quenching is accompanied by the hardening effect and apparently in these specimens and under the conditions of the experiment, the maximum hardening effect is obtained with quenching temperatures in the neighborhood of 900° C. (1814° F.). It is known that when cast irons are heated within the temperature range of 550 to 790° C. (1022 to 1454° F.), the combined carbon undergoes decomposition. It is suggested that the softening effect on quenching from these temperatures, as revealed by these results, is due to this cause, a fact which suggests that under many conditions the decomposition of the combined carbon, pearlite, initially present in the cast iron, may be a preliminary to hardening by quenching from temperatures high enough to secure the solution of the graphite thus formed.

"From experiments conducted on centrifugally-cast material, it has been shown that in suitable thin sections, plain unalloyed cast irons are susceptible to the hardening and tempering treatment."

With combinations of manganese and molybdenum, strength values of very high order are obtained after suitable hardening and tempering treatments.

The French contribution deals with the details of a number of applications, the data on the two automotive parts being given almost verbatim. In conclusion, the authors offer the following important observations:

(1) Quenching is most often utilized for increasing the hardness, the improvement in other mechanical proper-

ties being considered as secondary. It is true, of course, that a high-quality iron with or without alloy additions will produce higher strength, transverse and shearing values than a mediocre iron, when treated. However, mechanical properties of the best irons can be still further improved by a judicious heat treatment thereby elevating very considerably the "ceiling" of mechanical properties obtainable.

(2) With unalloyed irons, when it is desired to increase the hardness and mechanical properties, it is necessary to lower the carbon, that is to say, the proportion of graphite. When only compression, transverse, tensile and shearing strengths are of import for

the pieces to be cast, there is no disadvantage, but if good friction and wear resistance is required, a certain quantity of graphite is necessary. For numerous applications involving wear, the best irons are those which are hard and contain a considerable amount of graphite. These two conditions are contradictory in the case of ordinary irons, but can be readily realized with alloy irons subjected to heat treatment

The first of the applications is that of replacement sleeves for automobile engines. These are being used in France for passenger cars and commercial vehicles and there is a definite tendency toward their adoption for production engines.

"Numerous compositions have been tried for such castings. Among the most interesting and economical, due to excellent wear resistance, are the martensitic irons, treated after machining. The usual average composition is:

	Per Cent
Total carbon	2.8 to 3.0
Silicon	1.5 to 1.8
Manganese	0.8 to 1.0
Phosphorus	0.30
Nickel	2.5 to 2.8
Chromium	0.5 to 0.7

"These irons are usually produced
(Turn to page 708, please)



Trailer for U. S. Coast Guard

Has 11 inch Tubular Backbone

ALTHOUGH the Marmon-Herrington Co., Inc., of Indianapolis, is primarily interested in the production of four and six wheel drive motor trucks, they recently delivered an order of special trailers to the U. S. Coast Guard which makes an excellent commentary on the special engineering facilities at the command of this organization.

The trailer shown in Fig. 1 and 2 is designed for the transportation of Coast Guard life boats. It is extremely light, the gross weight including a 2600 pound surf boat being only 8200 pounds, and its mounting on 15.00 x 16 airplane tires makes possible the movement of the unit along a sandy beach as well as an approach right to the water's edge at times of an emergency.

The main element of the trailer is the tubular member 11 in. in diameter to which are welded two built up transfer frames to carry the spring supports. Near the extremities of the backbone are adjustable supports to steady the trailer at rest. The boat is held in place by means of two sets of chock blocks—two end blocks for the

Specifications

Weight stripped.....	3,300 lb.
Overall length.....	330 in.
Allowable gross weight on spring pads.....	10,000 lb.
Allowable gross weight on tires.....	14,000 lb.
Gross weight with 2600 lb. boat.....	8,200 lb.

eye while the upper eye in front and the single eye at the rear will fit the pintle hook of a truck-tractor or cargo unit.

At the front end of Fig. 1 you will note the two individual connections for the 15 x 2½ in. double line booster brake system. In addition, there is a separate hand brake of the ratchet type. In the same view you will note on the right hand side a small diameter tube which is supplied for attachment to the drawbar. The tube is six foot long and it is possible for six men to draw the trailer, loaded, by means of this connection.

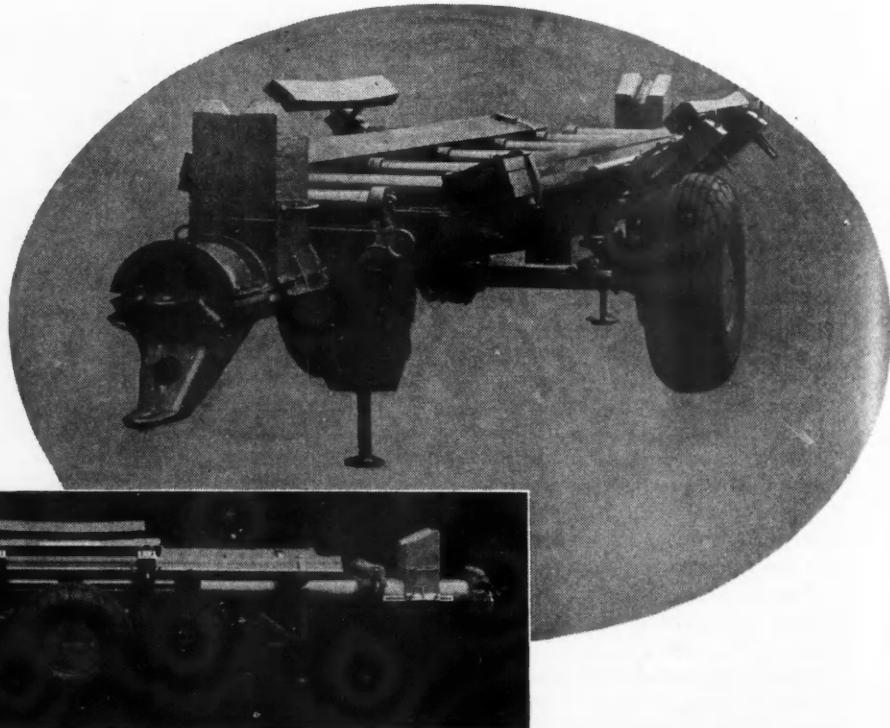
Holes punched in the sides of the transfer frames not only lighten weight but serve as storage racks for tubular rollers which are unshipped to facilitate handling of the boat in loading and unloading. The row of roller assemblies on the longitudinal axis of the trailer are mounted on individual eccentric bearings with practically infinite adjustment range so as to take care of any keel. All fastenings are of non-ferrous metal to prevent salt water corrosion.

keel and two side blocks at the extremity of transfer frames. The side blocks have ample adjustment, slideably, to take care of variations in the width while the keel blocks can be moved endwise to handle keel variations.

The tubular backbone is provided with double drawbar eyes at the front and a single eye at the rear. The purpose of the double end is to provide attachment for a tractor to the lower

Fig. 1. Three quarter front end view showing double eye draw bar and details of side chock adjustment. The left chock is in the extreme up position—the right side is in extreme down position.

Fig. 2. Full side view of trailer showing tubular backbone 11 in. diameter and 330 in. long with drawbar ends. It also shows the end rollers as well as the lengthwise adjustment of the keel chocks.



JUST AMONG OURSELVES

Motor Administrators Talk It Over

SOME very interesting trends were evident from informal conversations this week with people attending the Spring meeting of the Eastern Conference of Motor Vehicle Administrators, which convened in Philadelphia. It was evident for one thing that vehicle speed, long a phobia of the administrators, particularly when advertised by the manufacturers of vehicles, has been superseded by brakes, lights and bumpers as subjects for viewing with alarm.

It was the second time during the week that bumpers came in for attack. Earlier, physicians at two of the medical association conventions held during the week flayed the positioning of automobile bumpers as developing a new accident hazard called a "bumper fracture"—human legs broken in automobile accidents are being broken in places difficult to heal, and the medicos are blaming it on "streamlined" modern cars.

Medical Slants On Safety Up

WE recently had occasion to examine the medical literature on the contribution of car design to accident hazard and found it very scanty. We have a feeling, however, that it is going to grow rapidly within the next year, unless certain criticisms can be met by the vehicle manufacturers; for, although the literature is scanty, it offers a new subject for medical journalism.

There is plenty of material in hospital records on experience with safety glass and various protuberances inside and outside

cars with respect to their contributory place in traumatic surgery arising out of automobile accidents.

Motor vehicle administrators have become conscious of the medical literature and are studying it with one eye on legislative possibilities.

New Group Under Way

WE heard with interest that in District 3 of the American Association of Motor Vehicle Administrators, whose membership is in the Middle Western states, an organization has been formed of the enforcement officials, concerned with application of motor-vehicle laws and of safety regulation. Efforts will be made, it is believed, to promote the formation of such organizations paralleling the framework of the American Association. This is another step in the direction of national uniformity and solidarity in the enforcement of the motor-vehicle laws, an effort which began 10 years ago with the first National Conference on Street and Highway Safety.

There was considerable agreement, informally, that the Roper Committee on Safety had been an abortive effort, and that future Federal efforts would have to take another tack if they wished to be successful. Part of the difficulty of the Roper effort, it would seem, came from the administration yielding to pressure from certain directions, without consulting other interested organizations which had experience in the safety field, and had been proceeding with constructive effort.

Federal Aid For Safety?

THE prospect of Federal Aid for motor-vehicle safety came into open discussion at the Administrators' meeting. It is our understanding that the Eastern group was the second in the American Association to give it consideration.

It seems to us that this is a particularly infelicitous time to be seeking government aid for a new project. Commercial organizations have already accepted their just responsibility in the matter of promoting motor-vehicle safety and have been doing a good deal of constructive work. We have found occasion ourselves to criticise some of the detail of this work, but on the whole, we believe it could far better continue in the control of private responsibility.

Under the enlightened administration of the Bureau of Public Roads, the Federal Aid highway system has been subject to less criticism than any other government agency entrusted with the administration of a tenth of the funds dispensed by the Bureau. But dispensing of a similar fund for Federal Aid of safety effort would bring up innumerable new problems, some of which would have to be met by Federal legislation.

Surely the experience of the automotive industry with Federal attempts at regulation has been of such a character that no further efforts in this direction are to be encouraged.

Federal Aid for the highway safety movement would unquestionably serve the interests of one or two organizations concerned with the problem, but we question seriously whether it would be to the ultimate advantage of the safety movement.

If, as we believe, the success of the movement depends upon its ability to reach the average driver in human terms, there is no place for Federal jurisdiction, whose approach to humanity is necessarily through an increasing and expensive bureaucracy.

—H. H.

A CONTINUOUSLY variable transmission for automotive and industrial applications has been invented by H. B. Greening and J. B. Galloway of Hamilton, Ont. It is covered by a number of U.S. patents which were assigned by the inventors to the Galloway Engineering Co., Ltd., Hamilton.

The transmission is of the familiar "variable-throw" type in which a driving shaft is caused to produce smaller or greater angular movements of an intermediate member in quick succession and these angular movements are transmitted to the driven shaft through a "mechanical valve" which usually takes the form of a roller clutch.

This transmission gives an indefinite number of speeds, all of which are available without interruption of the driving torque, as occurs in an ordinary sliding-gear transmission whenever a change of gear is made. A unique feature of this transmission is that reversal of the driving member does not result in a reversal of the direction or rotation of the driven member. Torque conversion is claimed to be accomplished with very high efficiency, the losses being practically negligible.

The earliest work was done with a

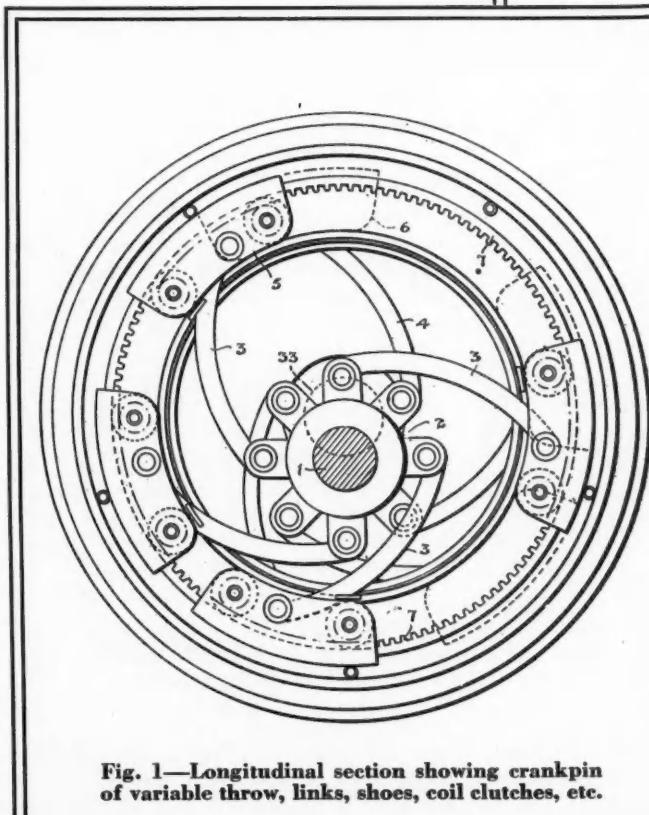


Fig. 1—Longitudinal section showing crankpin of variable throw, links, shoes, coil clutches, etc.

Continuously

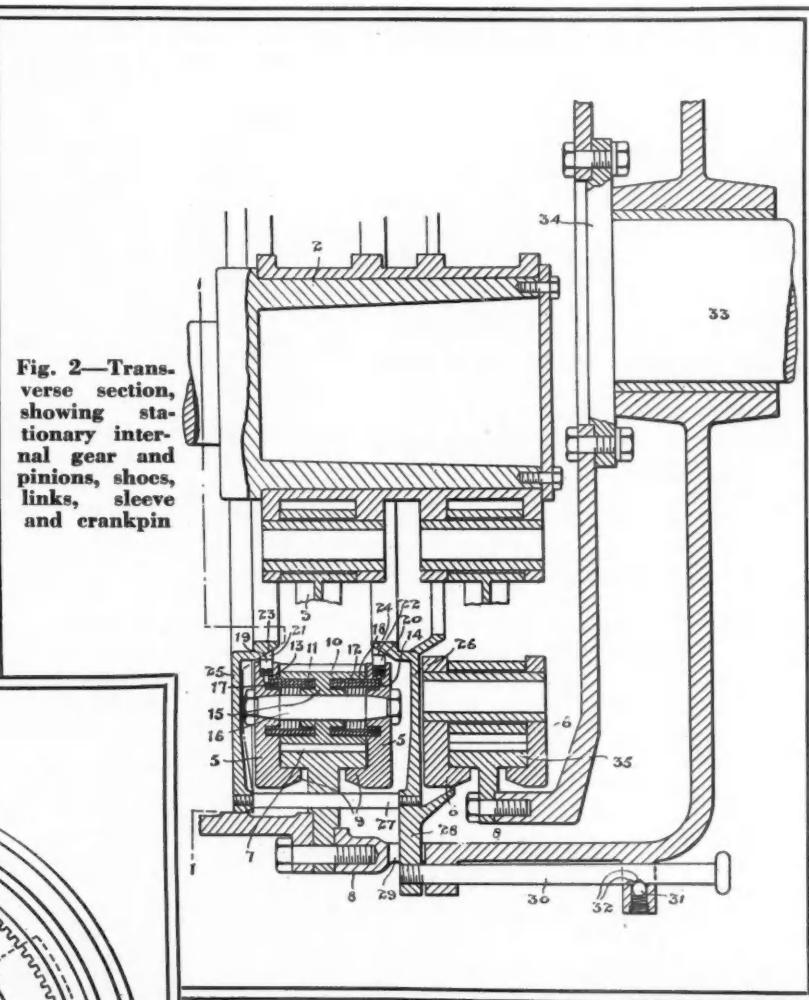


Fig. 2—Transverse section, showing stationary internal gear and pinions, shoes, links, sleeve and crankpin

"mechanical valve" of the roller-clutch type, such as was used in the Studebaker free-wheeling unit. This design is said to be suitable for units where the amount of power to be transmitted is small. In order to make it possible to transmit large torques if required, a coil-clutch type of "mechanical valve" was substituted for the roller clutch, based on the same principle as the L.G.S. free-wheeling unit. With this design, any automotive power requirements can be met with very moderate housing dimensions, according to the inventors.

With this transmission the torque is changed in substantially inverse pro-

Variable Transmission

Uses Coil Clutches for "Mechanical" Valves

portion to the speed change, and the device is therefore a true torque converter. One of the features of this transmission is that it is over-running at the output end and the device therefore acts as a powerful ratchet. The over-running feature tends to "iron out" the impulses of the individual arms. The effect on the output torque is somewhat the same as that of the overlapping impulses in a multi-cylinder engine on the crankshaft torque. It is claimed that while there may be fluctuations in torque and speed theoretically, in practice the inertia or flywheel effect of the driven end keeps the speed uniform.

The unit is said to lend itself to many applications. It was originally evolved as an automobile transmission, but later on industrial applications came to the front. As constant-speed alternating-current motors are very widely used for such purposes, the possibilities of direct drives are limited.

The combination of one of these torque converters with a constant-speed alternating current motor gives all of the desirable features of a direct-current electric motor. That there is need for such a device is said to be indicated by the large number of variable-speed drives which have been placed on the market recently. However, most of these drives are said to be either expensive or else limited to 15 hp. in capacity, whereas the manufacturing cost of the torque converter here described is very reasonable and the capacity which can be built into it is unlimited.

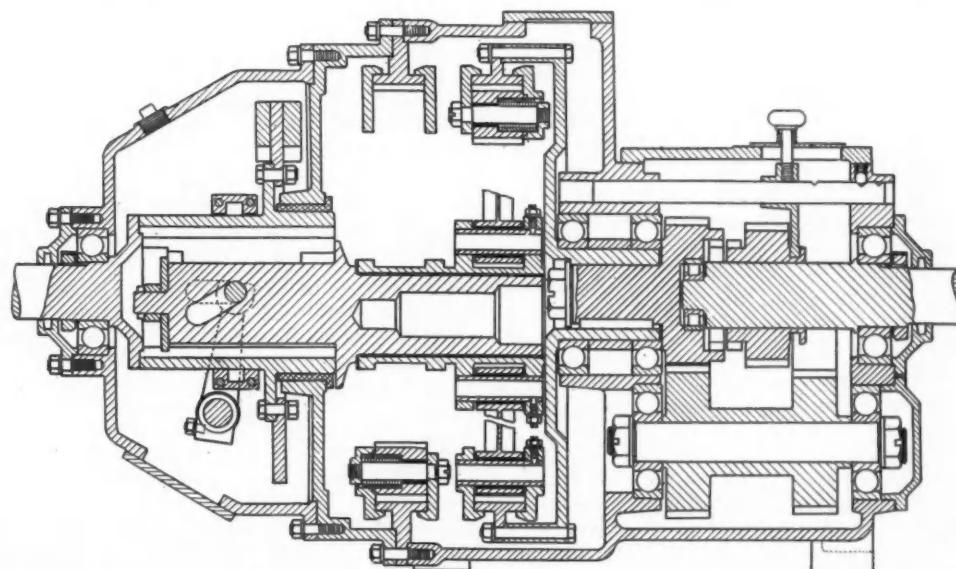
The operation of the device may be described with reference to Figs. 1 and 2 herewith. Rotation of crankpin 1 about the axis of the driven member and the shoes 5 on the arms 3 progressively grip the gear ring 7 through the medium of the pinion and gear teeth and the over-running spring clutches in the pinions. When these shoes grip the stationary gear ring

the sleeve 2 carried by the crankpin is rotated on the pin and the rotative action on the pin is imparted to the arms 4, which are pivotally connected thereto, and their movement is transmitted through the automatic over-running clutches therein and the teeth of the pinions carried thereby to the internal gear ring 35 which is connected with the driven shaft.

Each set of arms operates through a certain distance to rotate the driven shaft, and the movement is picked up by the succeeding arms as the crankpin 1 rotates about its axis.

The ratio of rotation between the driving and driven member is varied in accordance with the eccentricity of the crankpin 1 from the crankshaft. This change in eccentricity is brought about by means of a shifter lever and shifter collar shown toward the right in Fig. 3, which illustrates an actual design of an industrial drive embodying the features of this invention.

Fig. 3—Latest design of continuously variable transmission for industrial applications. The driving end is at the right



The Horizons of Business

by Joseph Stagg Lawrence

Fresh Light on Relief

NEW JERSEY bids fair to solve the most irritating problem of recovery, to wit, unemployment. We use the word irritating advisedly because the problem has long since passed beyond the field of social or humane solicitude. Business has been continuously badgered about its alleged failure to provide employment. The charge has been a plausible slander upon American industry, one of the most vicious and transparent sophistries of the past three years. Time after time spokesmen of the government have used solemn occasions to reprimand business for the millions of the idle who in the interval must live upon the bounty of a government less flinty hearted than the employers who refuse to give them jobs.

Responsibility for the entire twelve million idle has been placed at the door of American industry although industry in the technical sense at its peak of employment in 1929 employed only about fourteen million. At present its payrolls in the aggregate contain more than 80 per cent of the workers employed in the boom years. In some fields notably, automobiles, aviation and rayon, employment is at or above 1929 levels.

A Text for Labor

Leaders of organized labor have seized avidly upon the spurious fact of unemployment. With broad strokes, over and over again to the point of weariness, Mr. Green has pointed to the vast army of the idle and then leaped with undeviating persistence to his minor and major conclusions, first, that unemployment has been due to technological progress, second, that the remedy is shorter hours. All agitation is based upon the presumed necessity of spreading work in order to absorb the idle.

The Scientific Approach

There are certain aspects of this official concern for the unemployed which have long puzzled the observer. Ad-

mittedly unemployment and relief together constitute our greatest economic as well as social problem. To date the precise cause of this unemployment has depended for its authenticity upon the hypotheses of politicians and labor leaders repeatedly intoned over the air and across the headlines of the press.

The physician who deals with a serious malady which he has not yet diagnosed applies palliatives to be sure. But he also applies himself at once to a study of the ailment which will enable him eventually to cure the patient. Particularly is this the case when the patient fails to respond to first hand treatment, when the disease is so serious as to threaten the future usefulness of the patient, when the community places limitless means at the disposal of investigators who may thus search for the true causes. This is the scientific attitude. In the light of broad social welfare, a phrase much on the lips of public men, such an intensive search for cause and cure is both commendable and imperative.

Starting With the Answer

The Secretary of the Treasury in his recent testimony before a Senate Committee on the surplus earnings tax bill admitted a deficit for the current year of approximately \$6,000 million. More than half of this red ink balance is allotted directly or indirectly to the unemployed. Until very recently the government has resisted the use of funds for the purpose of determining the character of the unemployed, the particular reasons for unemployment, and, from a knowledge of causes, the appropriate solution. The answer was already known, i.e., under consumption of goods, inadequate purchasing power, technological progress, exploitation of workers, inequitable distribution of wealth and income, etc.

Politics Presents a Gift

For all these reasons the country should be grateful to the State of New

Jersey for the convincing if unintentional light which it has directed upon this problem. It may be recalled that the state government has been in a violent stew for some months regarding the appropriate source of funds for relief. The merit of the opposing cases is beside the point. The dispute between the various parties has been fairly described as a political dog fight. It must not be assumed that local statesmen in a noble mood decided to risk political extinction *pro bono publicum*. Exalted motive had nothing whatsoever to do with it. The fact is the squabble became so bitter that nothing was done about relief. No appropriation was made; no taxes levied; no program adopted. In the absence of any provision for the idle their care reverted to local governments.

A Case Study in Relief

The results are well described in an editorial of *The Sussex Register*:

"Here is a typical case of the relief problem as we find it throughout Sussex County.

"In Andover there have been between ten and twelve able bodied men on relief all winter. They received their money every week. Relief was a wonderful thing. But then something happened. The relief funds dried up over night. The legislature and the Governor played bean-bag with it and no money was forthcoming.

"The Andover reliefers were told the bad news. No money. But what did these poor, jobless, pathetic cases do? Did they starve? No. Did they beg? No. Each and every one of them got a job within a week—and they have all been working steadily ever since."

From other parts of the state come reports that relief cases have been cut more than fifty per cent. Insofar as editorial opinion reflects community thought the return of this problem is welcomed by these communities. Relief had reached a stage where it threatened to undermine the healthy fibre of local life. The recipients of relief could not be disciplined by their neighbors who knew well when they were "chiselling." These neighbors on the whole are still

(Turn to page 711, please)



AUTOMOTIVE ABSTRACTS

Beryllium Bronze and Some of Its Applications

BERYLLIUM bronze, which after tempering possesses mechanical properties very much the same as those of steel, is used as a substitute for the latter wherever a higher electrical or thermal conductivity or greater resistance to corrosion is desired. Its good frictional properties and its high resistance to fatigue also are being taken advantage of.

Steel is unsuitable for numerous springs, contacts, vibrating reeds, etc., used in the electric and radio industries, on account of its low electrical conductivity. Formerly phosphor bronze was extensively used for such purposes, but it had the disadvantages of a low elasticity and ready deformation in use. Beryllium bronze, which is a better conductor than phosphor bronze and also of the same elasticity as steel, solved the problem.

Beryllium bronze is said to be particularly adapted for valve springs for internal combustion engines, both because of its high resistance to fatigue and its good thermal conductivity. This material lends itself to many other uses, such as springs for pressure gages, by reason of its resistance to corrosion. Springs of beryllium bronze, moreover, are said to be more permanent in their elastic properties than steel springs, because the hardening by tempering produces a stable state in the material, in contrast to hardening by quenching.

Beryllium bronze, which will take a high polish and has a very low friction coefficient in conjunction with steel, is well adapted for use in bearings, such as piston-pin bearings. It is also used for hammers, gravers, screw drivers and other tools for use in powder factories because it does not produce sparks.

In the United States the Beryllium Development Corporation claims to produce 45 to 55 lb. of beryllium per month, which is sold at \$145 per pound. The Brush laboratory and the laboratories of the War and Navy Departments are also interested in the subject. The Beryllium Development Corporation in 1934 entered into an agreement with the German Siemens & Halske Company. According to a table published by the last-mentioned concern, the price of 98 per cent pure beryllium in Germany dropped from \$36,000 per lb. in 1922 to \$110 in 1933.—*Revue de L'Aluminium* for January.

Wear of Austenitic Cast - Iron Liners

CYLINDER liners of a special austenitic cast iron called "Brimol" are manufactured by The British Piston Ring Co., Ltd. Results of some wear tests on a six-cylinder engine fitted with these liners are given in an article by T. R. Twigger of the Technical Department of the concern mentioned. Both the liners and the compression rings were of the austenitic iron, while the oil rings were of centrifugal chill cast iron. After 7813 miles the cylinder bores were measured and the maximum wear found was 0.00065 in. Cylinder wear was checked again at 16,010 miles and 25,313 miles. At the former mileage the maximum wear was 0.0019 in. and at the latter, 0.0028 in. Taking the average wear of all six cylinders, a wear of 0.001 in. on the diameter resulted from 18,600 miles of service according to the measurements

at 7813 miles; 12,100 miles according to the measurements at 16,010 miles, and 12,000 miles according to the measurements at 25,313 miles. Engine oil was added to the fuel as an upper-cylinder lubricant for the first 3000 miles, but not thereafter. The oil was changed regularly every 2500 miles. The carburetor air cleaner was discarded shortly after the liners were installed and a hot-air pipe fitted, the pipe being carried into the slip stream from the fan where it was exposed to road dust distributed by the fan, so the operating conditions were quite severe.—*The Automobile Engineer* for February.

Protecting Corrosion Of Magnesium Alloys

AMONG the processes employed for protecting magnesium alloys against corrosion, the most popular at the present time consists in forming a protective coating on the surface of the parts by chemical action. After being cleaned by immersion in a dilute sulfuric acid solution, the parts are rinsed and are then immersed for several hours in a bath of alkaline chromates and bichromates, diluted and heated to about 194 deg. F. This process produces a complex adherent yellow coating on the surfaces of the parts which protects the metal underneath against attack. The protective effect of this coating is often increased by impregnation with fatty material.

Experiments made with a view to protecting magnesium alloys by sherardizing, calorizing or metal-spraying by the Schoop process did not give successful results, and attempts to protect such parts by electroplating also have proven futile so far. The parts may be given a coating of enamel or lacquer, which may be applied to them either in their natural state or after they have been treated in the chromate bath, which latter improves the adherence of the coating.

Finally, parts of this extra light metal may also be protected against corrosion by the formation of a film of selenium, produced by immersion for a few minutes in a bath containing selenious acid at normal atmospheric temperature. According to the experiments of Bengough and Whitby, reported in the *Journal of the Institute of Metals* during 1932 and 1933, the film thus formed has the interesting property of reforming at points where it has been damaged, thus giving an automatic protection of the metal to a certain extent.—From an article on the general subject of Magnesium and Extra-Light Alloys in *La Technique Moderne* of Feb. 1.

Racing Cars by Jamieson and Austin

ANUMBER of small racing cars designed by T. Murray Jamieson have been built under the sponsorship of Sir Herbert Austin. They have four-cylinder engines of slightly less than 750-cu. in. displacement and therefore will race in the 750-cu. in. class. The engine has a bore of 2 1/8 in. and a stroke of 2 9/16 in. Cylinders and crankcase are in a single light-alloy casting which is fitted with liners. These liners project above the cylinder block and the projecting portion is provided with cooling fins. The finned portion of the liner is surrounded by an extra detachable section of the block, with a gasket below and on top. Cylinder heads are also of light alloy and have valve seats of hard alloy screwed in place. Spark plugs of 14-mm. size are being used and screw directly into the aluminum of the head, the spark points being located in a separated cham-

ber from which there is an outlet to the main combustion chamber directly opposite the spark-plug hole. There are two large-diameter tubular camshafts running across the cylinder heads, which operate the valves through the intermediary of pistons of considerable size. The under side of the piston is provided with a disk which contracts with the end of the valve stem. This disk is filed to adjust the valve clearance and is held in position by a snap ring. The piston surrounds the valve and its two concentric springs, and it has a return spring to itself. Provision is made to allow air to escape from the inside of the piston. The engine is said to be capable of a maximum speed of 12,000 r.p.m.

Camshaft and accessories drive is by space gears, the accessories including a magneto and a blower. The blower takes its mixture from a special S.U. carburetor and delivers to a ribbed inlet manifold provided with a blow-off valve. For lubrication a triple gear pump is provided. One pump feeds oil under high pressure to the crankshaft bearings, another under low pressure to the camshaft and supercharger bearings, and the third is a scavenging pump. Main-bearing and crankpin diameters are unusually large. Pistons are of aluminum alloy, their domes being cut away so they will clear the valves.

This racer has a wheelbase of 82 in., a track of 47 in., and weighs 1092 lb. The engine power is given as 90 b.h.p. on long-distance fuel and 116 b.h.p. on sprint fuel, at 7600 r.p.m. As the displacement is 45.4 cu. in. the engine develops practically 2 hp. per cu. in. displacement on the long-distance fuel and more than 2.5 hp. per cu. in. displacement on the sprint fuel.

To place the propeller shaft low, a double-reduction final drive is used, comprising a first reduction through level and a second through spur gears, the spur pinion being below the gear. The rear-axle center housing is heavily ribbed, and the lower portion has cooling fins extending fore and aft. A tubular front axle is used, with radius rods to both the top and the bottom of the steering head. Front suspension is by a cross spring.—*The Autocar* of March 20.

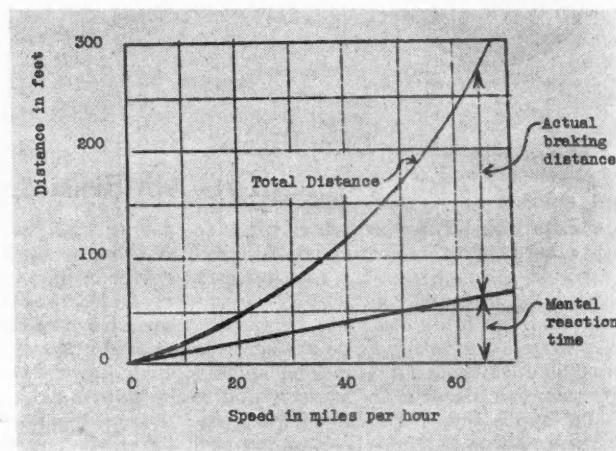
Road Lighting and Visibility Distance

A NUMBER of papers have been presented recently to professional organizations in which the relation of road lighting to safety of road travel is dealt with. According to Paul H. Goodell, who presented a paper to the Illuminating Engineering Society, a survey of traffic accidents has shown that the hazards are four times greater at night than during the day time, which indicates that speeds at night are greater than conditions of visibility justify. Investigations by the University of Maryland and the State of Michigan indicate that the average speed by day is 43.3 m.p.h. and by night 41.5. The Michigan studies show that 10 per cent of the vehicles travel at speeds greater than 60 m.p.h. Mr. Goodell discusses the effects on visibility of lighting by headlights and by fixed lights along the highway, and also their relation to the stopping distance of motor vehicles.

Tests were conducted by the Eastern Conference of Motor Vehicle Commissioners to determine the minimum stopping distances of motor vehicles on dry, level, paved roads, with brakes in proper adjustment. Other tests made recently at the Massachusetts Institute of Technology show the reaction time required to coordinate mind and muscle in stopping a vehicle. The author has combined the results of these two experiments in Fig. 1.

The author made tests to determine the distances at which drivers, not aware of the tests, were able to distinguish objects placed on a straight, level highway and illuminated only by headlights. Variables considered were beam candlepower, visual rating of observers, speed, type of road surface, reflection factor of test objects (corresponding to pedestrians dressed in dark, medium or light clothing, reflection factors of 4, 12 and 29 per cent respectively).

Visibility distances increased rapidly with light intensity up to 6000 beam candlepower. A survey of several cars showed a few with beam candlepower over 10,000, while the vast majority were considerably below this, with some as low as 2000. It was found in several cases that six months of ordinary use decreased the strength of the headlight beam by 60 per cent or more. Visibility distance decreased



as the speed increased. This distance at 60 m.p.h. was only half that for stationary tests. The longest visibility distances were obtained on new concrete pavement. With 6000 candlepower, 40 m.p.h. speed, distances for dark, medium and light objects were 105, 155, and 180 ft. respectively. An additional 35 ft. was obtained for each additional increase of 15,000 candlepower. The higher intensities are desirable, but must be used in a way which will not create objectionable glare.

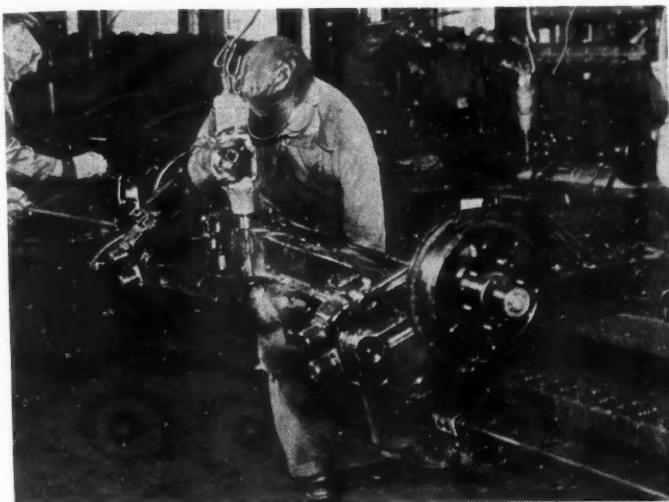
Fixed lights have the advantage that they may be so placed as to provide a luminous background against which the object may be silhouetted. This result may be accomplished with a minimum of lighting.

In another recent paper read before a foreign body of road engineers, different methods of fixed road illumination are discussed. It is pointed out that the eye perceives by contrast and that to make objects stand out on the road the contrasts must be accentuated by increasing the brightness of either the objects to be seen or the road surface. Since the majority of objects to be seen on the road at night are dark-colored and reflect less than 15 per cent of the light which falls on them, the best way to get the necessary contrasts is to light the road surface, thus showing the dark objects on a light background. Two methods are used to get the desired lighting of the road surface: first, by exploiting the optical properties of road materials (specular reflection); second, by high illumination of the road surface (diffuse reflection).

By the first method the road surface is made to form a light background by virtue of its shininess or polish. Light is directed onto the road in such a way as to utilize the tendency of most materials to reflect light specularly when it strikes at low angles of incidence on the road surface. Even the road surfaces of dark materials reflect considerable light in this manner. The result with this type of lighting is a path of reflected light as a background to reveal any object on the road. The smoother the surface, the narrower the path of reflected light. The position, height and intensity of the lights must be arranged to get the best reflection for the particular kind of surface being lighted, since the brightness of the road, as the driver sees it, consists of a series of paths of light from the observer's eye to the lamps along the road ahead. Lamps at the sides of the road rather than over the center are better for this type of lighting.

By the second method the object has been to illuminate the road as highly as possible, assuming that this would effect a good road brightness by diffuse reflection. The

(Turn to page 710, please)



Master Chevrolets, which are equipped with Knee-Action, have no front axles. The two units are mounted on a cross-member, which is bolted solidly to the chassis frame. The bolting operation, with the chassis and Knee-Action assembly upside down, is shown here.

AFA Show

We have never quite got over that boyhood urge for collecting catalogs and things. And the yen crops out whenever we attend a convention such as the AFA in Detroit last week. Going through the mammoth display of foundry equipment at Convention Hall, we corralled quite a few good looking and really informative pieces of technical literature among which were some particularly striking bulletins by Link-Belt, Bartlett-Snow, and Chain Belt. There is a rather fine technical bulletin on "molybdenum in the foundry" supplemented with interesting graphic data that you may want for your book shelf. And then, too, is Bulletin 111 describing many applications of the new Wheelabrator for metal parts cleaning by abrasives that has taken the industry by storm.

Changes Cushion

Before long several cars of a prominent line will feature a revolutionary seat cushion construction. Cushion springs are absolutely out in this design. Instead, they will use a special rubber-coated wire screen so processed as to produce a degree of resiliency said to be superior to the customary spring construction. The specific material is the subject of a basic patent held by the corporation whose name we are not free to divulge at the moment.

Plant Visits

The plant visits arranged for the SAE Production Activity were of great value in many respects. For one thing,

they gave the visitors an opportunity to see things that they had never seen before. Many of these men expressed great admiration for the extrusion plant of the Aluminum Co., the permanent mold casting of aluminum pistons at Amplex, and the remarkable glass works at the Ford Plant. Such visits not only are educational but of tangible commercial value to those who open wide the gates.

Coming Soon

We have it on good authority that a novel tool-cutting material is on the way and may be announced some time soon. Its purpose is to fill the demand for something better than high-speed steel and not so expensive as cemented-carbides for many small lot jobs and even production runs. Sorry we can't tell you more about it. Maybe if there is enough interest, we can get them to say something in a hurry.

Surface Broach

More than a year ago we talked of the possibility of using surface broaching for the machining of the large areas of cylinder blocks. These early predictions will be a reality this coming season in tooling up one of the six-cylinder engines that is expected to make its appearance.

Cutting Fluids

An independent research committee on cutting fluids has been organized. Not content with the slow progress being made along lines of standardization and simplification of this basic pro-

PRODUCTION LINES

duction tool, a group of metallurgists and oilmen have got together to try to grease the wheels of progress. You'll hear plenty about it in the very near future. In the meantime we need help. If you are interested drop us a line.

Hard Facing

Oxy-Acetylene Tips for April has a two-page table giving much data concerning hard facing materials. It covers the physical properties of each grade, applications, estimated life, etc. Such information should be of interest to maintenance men and production men in general. You will find it in your copy of "Tips."

Not Too Late

It is now possible without untoward expense to produce a standard automobile for 1937 with an absolutely clean exterior—free of protruding hinges and free of protruding door handles. It would be truly a smooth flowing, tailored job. There are several parts makers who can offer a simple concealed hinge; and there is one large manufacturer who can supply a beautiful flush-type door handle that will fair with any kind of body molding. It's not too late to consider these things.

Add Efaklin

Wonders of chemistry never cease. Here, for example, is a contribution from abroad—a luminous paint for coating highly stressed parts or machine elements subject to injurious temperature effects. If the temperature of the coated part goes beyond the safe limit, the dab of paint changes to a deep black, thus giving a warning signal. The material comes in various compositions to indicate a variety of temperature gradients. Might even be used as a dashboard indicator for automotive equipment.

—J.G.

MANUFACTURING
MANAGEMENT
METALLURGY

40th Annual Convention of American Foundrymen

(Continued from page 697)

in the cupola. The nickel and chromium additions are made in part to the charge in the form of risers, etc., and in part to the ladle in the form of nickel-silicon shot. An iron of the above composition is machinable as cast, the Brinell hardness being around 270 to 300. The sleeves are generally cast

with a collar at each end, to avoid any deformation which might be produced during machining or oil quenching.

After machining, save for finishing, the castings are quenched in oil at 1526 to 1562° F., then drawn at 482 to 572° F. so as to relieve internal strains and brittleness. Allowance must be made in machining for a very slight increase in diameter (about 0.004 in. for a sleeve of 4-in. diameter). After complete treatment, the hardness is around 450 Brinell and the metal is practically unmachinable."

The second application is that of castings for air-cooled aviation engine cylinders. These castings must have high mechanical properties, permitting light sections, and also should readily permit the casting of thin fins, 0.059 to 0.078 in. in thickness. Other requirements are—excellent resistance to wear and good thermal stability. "To meet all these requirements, a low carbon iron has been employed, though as far as wear resistance is concerned, an iron of higher carbon might have been preferable. To obtain a high hardness, a martensitic iron, drawn before machining to a Brinell hardness of around 300, has since been used. This iron has the following approximate composition:

	Per Cent
Total Carbon	2.8
Silicon	2.0
Manganese	1.0
Phosphorus	0.6
Nickel	4.2

"It is melted in the crucible with a mixed charge of hematite pig and 1.5 per cent phosphorus 'PL-3' pig.

"Despite a rather low carbon content, the iron also exhibits excellent wear and resistance in service. After 700 hours of service, the cylinder diameters were found to be but a few hundredths of a millimeter out of true in the zone of maximum wear."

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400 r.p.m. (depending on whether the unit was a six or four-cylinder engine. After completing these tests, engines and gears were completely disassembled to permit inspection of all important parts for wear and defects. Before acceptance the engine had to be assembled with its accessories and run for one hour for warming up purposes and then run for one hour at rated horsepower and engine speed.

Fuel Oil Temperature in Diesel Engines

The influence of fuel-oil temperature on the combustion in a precombustion chamber type of Diesel engine has been investigated by the National Advisory Committee for Aeronautics and the results are published in N.A.C.A. Technical Note No. 565, by Harold C. Gerrish and Bruce E. Ayer. Fuel was injected into the precombustion chamber of a single cylinder, four-stroke, water-cooled Diesel engine operating at 1,500 r.p.m. and with a compression ratio of 13.5. Indicator cards, exhaust-gas samples and engine-performance data were obtained for various fuel temperatures ranging between 124 and 750 deg. F. The injection characteristics of the fuel system and the appearance of the fuel spray were studied by injecting the fuel into the atmosphere. A common-rail fuel-injection system was used, with a hydraulically-controlled fuel injection valve operating at 8,800 lb. per sq. in. The fuel was heated by passing it through an electric heater between the pump and the injection valve.

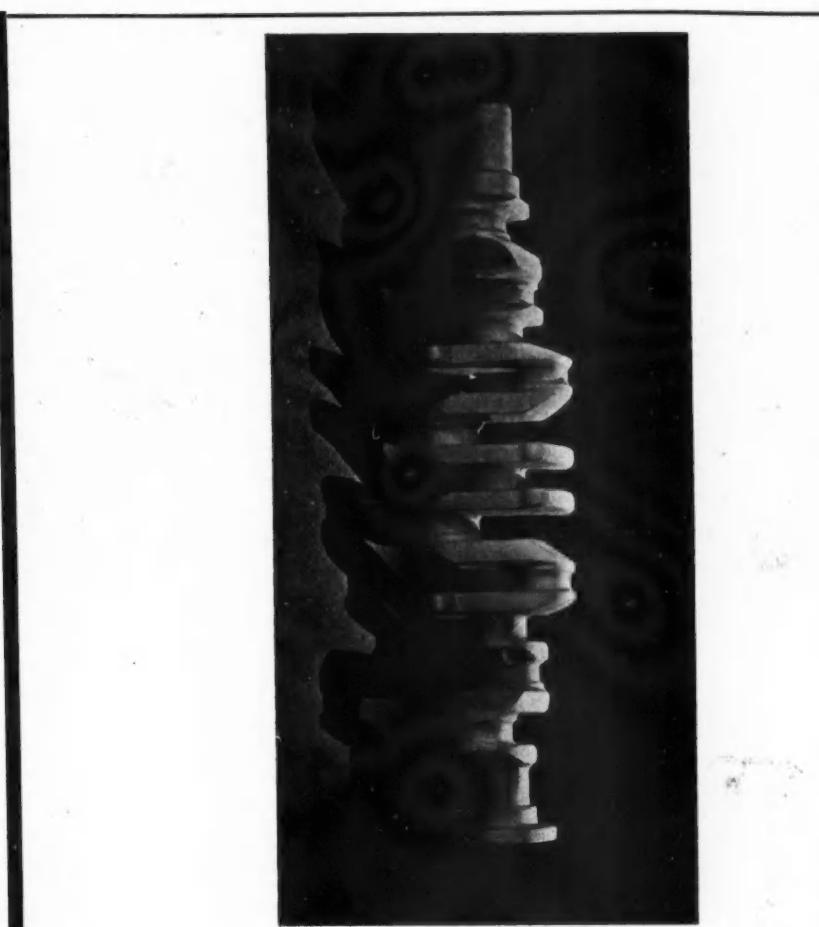
The results showed that heating the fuel to 750 deg. F. increased the injection period, changed the rate of injection, and eliminated the spray core. Engine tests showed that the ignition lag, rate of pressure rise and maximum cylinder pressure were reduced. The indicated m.e.p., the fuel economy and the thermal efficiency were slightly increased. Operation of the engine was smoother when the fuel was heated to 750 deg., the exhaust was clearer, and the carbon formation in the cylinder was considerably less than when the fuel was heated to 124 deg. The greatest relative change was in the ignition lag, which increased from 9.5 deg. at 124 deg. F. to 10.5 deg. at a little over 300 deg. and then decreased 6 deg. at 750 deg. F.

(It would seem that preheating of the fuel should be even more effective in cutting down the ignition lag and rendering the engine smoother in the case of a direct-injection engine, where the lag is usually considerably greater than in a precombustion-chamber engine.—Editor.)

Cast Crankshafts

Cast crankshafts have been used by Fairbanks, Morse & Co. for experimental engines and some production engines for three years, as pointed out at the recent S.A.E. Production Meeting by Anker K. Antonsen. The largest cast crankshaft now in use is an eight-throw shaft with 8-in. journals and 6½-in. crankpins. It is made of a ferrous alloy showing a minimum tensile strength of 52,000 lb. per sq. in. and a hardness ranging between 269 and 325 Brinell. The crankshaft weighs

approximately 1300 lb. in the rough, and 250 lb. of stock is removed in machining. The speaker said that if the shaft were made from a forging, approximately 2,000 lb. of material would have to be removed by machining. This would seem to indicate that in that case it would be turned up from a solid slab. Mr. Antonsen said the cast crankshaft had two advantages over a shaft turned up from a forging, viz., it retains its shape better, there being less distortion as stock is removed, and the finished surfaces are not easily mutilated.



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Book Reviews

(Continued from page 695)

sumed that the cylinder diagram is constant regardless of the speed up to 1800 r.p.m. and that beyond that speed it gradually decreases until it vanishes at 10,000 r.p.m. The mean total bearing load is directly proportional to the total maximum gas pressure on the piston. After this has been determined the bearing loads due to gas pressure and

dynamic forces are combined graphically. The diagram of bearing loads due to dynamic forces is a parabola, and the bearing load due to gas pressure adds to this at low speeds and subtracts from it at high speeds, so that at a certain moderate speed (which is different for each engine) the mean bearing load throughout the cycle is exactly equal to the mean bearing load due to the dynamic forces alone. The total mean crankpin bearing load is plotted on a base of engine speed.

The same method is applied in the calculation of main bearing loads and is illustrated by practical examples. Both vertical engines and V engines are considered. The book is illustrated by 29 diagrams which are combined in a handy atlas held in a pocket on the inside of the rear cover. This makes it possible to always have an illustration adjacent to a text page where it is referred to.

In addition to outlining the new method of determining main bearing loads for the whole speed range of the engine, the book discusses such items as the PV value for the different bearings, crankshaft balance, and counter-balancing.

A New DeVilbiss Fluid Strainer

The DeVilbiss Type VS fluid strainer is designed for attachment to the fluid inlet of the DeVilbiss Type MBC Spray Gun. Because the strainer is at the gun rather than at the supply tank, it has the advantage of being able to filter out residue and foreign matter that may be left in the hose.

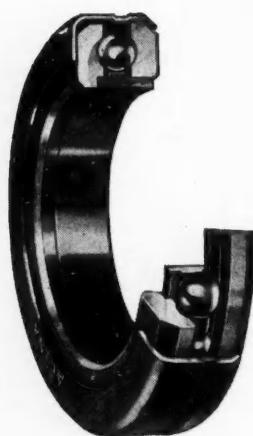
The strainer consists of a removable screen, reinforced by a coil spring and mounted in a tube. It is attached to the lower handle as well as to the intake, giving it rigid support and bringing the two hose connections close together. The DeVilbiss Co., 300 Phillips Ave., Toledo, Ohio, is the manufacturer.

New Collapsible Tap Announced by Landis

A hand sizing tap of the collapsible type has been added recently to the line of taps manufactured by the Landis Machine Co., Waynesboro, Pa. Designed to take the place of the solid ad-



**THE DUCKS
STILL FALL FOR IT
but...**



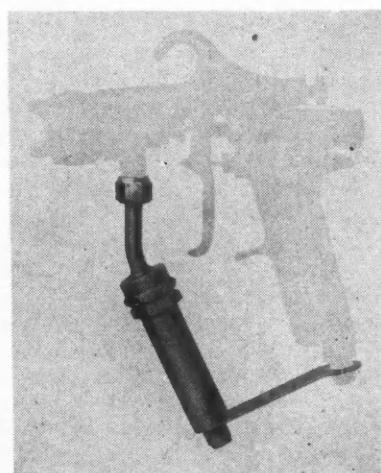
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May 16, 1936

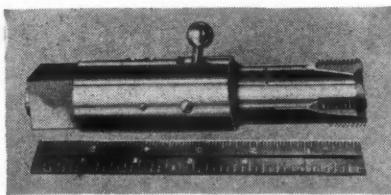


DeVilbiss fluid strainer

Automotive Industries

Ducks can still be lured by artifice, but motorists long ago learned to "turn tail" to cars that merely gleamed and glittered. Today they seek and demand quality and day in and day out dependability in even the hidden parts. And the industry has responded with modern "miracles-on-wheels" that rarely see repair shops.

Clutch release bearing troubles, for instance, came to a welcome end with the introduction of Aetna "T" Type Clutch Release Bearings. Self-lubricated for "life" and designed to permanently abolish eccentric thrust (troubles' principal source) these new-type bearings are rendering trouble-free performance on more than a million 1935 cars and trucks. If you use clutch release bearings, such industry-wide acceptance must counsel you to investigate Aetna's. Write for engineering information.



Landis collapsible tap

justable type, the new tap offers the advantage of instant withdrawal without requiring to be backed out.

A small trigger in the side unlatches the tap and collapses the chasers. Freedom from torn threads, greater tool life and higher speed are claimed for the new device. A total diametrical adjustment of $1/16$ in. is provided. The size of the $1\frac{3}{8}$ in. tap is indicated by comparison with the 6-in. rule.

Spicer Manufacturing Corp., Toledo, O., announces a new Brown-Lipe two-speed power take-off which can be fitted to trucks of all makes. It differs from an earlier, continued model in that it turns counter-enginewise instead of enginewise. Both models are of the push rod type and are equipped with poppets and springs to hold the gears in mesh. They are designed for either intermittent or continuous operation, with an output torque of approximately 140 lb.-ft. These power take-offs can be furnished with gears of any pitch, to fit any transmission.

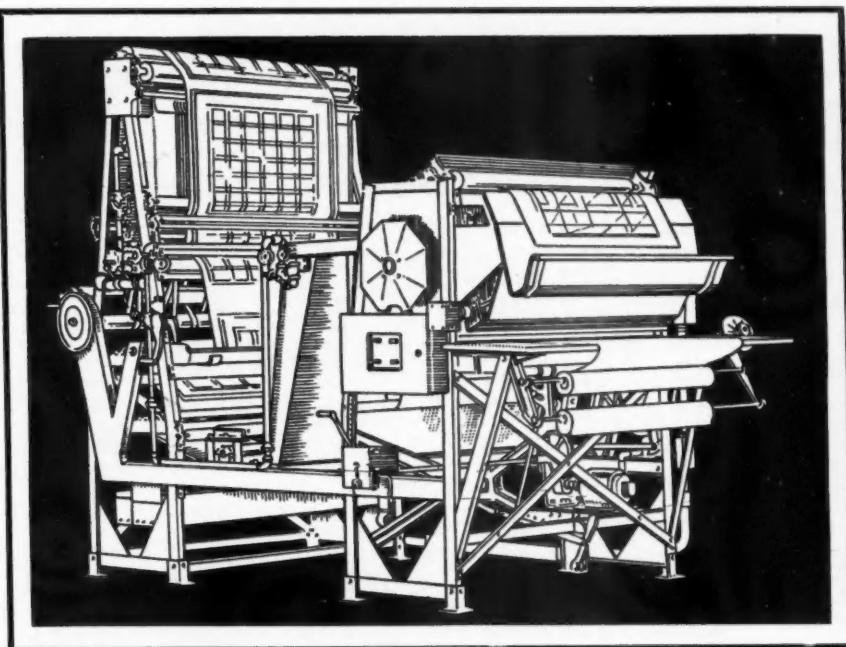
Corrosion Resistant Steel

A COMPARISON of a corrosion-resistant steel (18 per cent chromium, 8 per cent nickel) and aluminum alloy (24ST) with respect to their suitabilities for metal aircraft structures is made in Technical Note No. 560 of the N.A.C.A., of which J. E. Sullivan of the Bureau of Aeronautics, Navy Department, is the author. It is pointed out in the note that in the selection of materials for aircraft application, it is not logical to be guided by the strength/weight ratio alone. It is essential that the probable nature, magnitude and probable direction of the principal stresses be given consideration. In the note the two materials considered are compared on the basis of modulus of elasticity, impact value, fatigue value, internal stress, magnetic properties, effect of low temperatures on physical properties, corrosion resistance, and strength/weight ratio, and the following summary is given:

"All things considered, and in the absence of more extensive data on load-carrying capacities of stainless-steel structures, it is believed that aluminum alloy at present offers the best com-

bination of properties for fabricated structures of stiffened sheet and for columns. For highly stressed fittings carrying lugs, good design and psychological consideration point toward the use of steel forgings, heat-treated subsequent to forging. Where pure tension is the primary controlling factor, such as in wires and cables, aluminum alloy obviously cannot compete with other available materials. The structural advantages of high-tensile steel for practically all primary appli-

cations, however, cannot be dismissed, even though it may require protection against corrosion. The optimum steel should be one with a good stress-strain curve, uniformly high mechanical properties, and properties capable of reasonably accurate determination. Stainless steel, as it is now available commercially, does not meet these requirements, and it is doubtful as to whether production methods can be devised to make it so without increased expense to the consumer.



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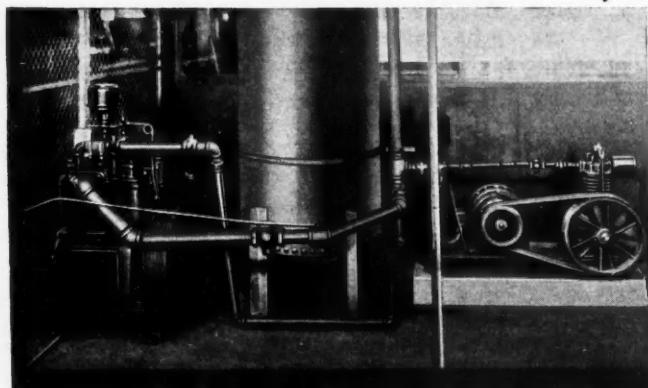
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AUTOMOTIVE ABSTRACTS

(Continued from page 704)

lamps are placed sufficiently close together and sufficiently high to produce a reasonably even illumination. This method has advantages especially for rough surfaces without polish. For other surfaces the road brightness for the same amount of illumination is usually less than where the first method is used.

Two good examples of diffuse lighting have been installed on the Continent, one in Holland and one in Germany. Both use sodium vapor lamps designed to send all possible light downward, but not along the road at angles nearer the horizontal than about 20 deg. The brightness of the road is of the order of 1/30 equivalent foot-candle. One equivalent foot-candle is the brightness of a white surface 1 ft. away from a standard candle. The brightness of these roads is enough to secure good visibility if the road is not wet and if headlights are not in the field of view. The brightness is more affected by the color of the road surface than by its roughness.

Two installations using the specular reflection principle are in England. These use mercury vapor lamps which are not screened, and an appropriate amount of light is directed along the road. The higher road brightness is relied on to prevent any glare from the lamps, and a road brightness of $\frac{1}{2}$ equivalent foot-candle is secured. The brightness is in considerable measure independent of the color of the road surface material and is more dependent on the roughness or smoothness of the surface. The visibility of objects is not seriously affected by headlights of opposing cars.

No means have been found to render visibility anything like as good under wet as under dry conditions. For installations using the reflection principle there are still bright lanes of light on the wet pavement, although narrower than when dry. For diffuse lighting the road will appear very dull when wet, as very little light is then diffused.

Electrical Novelties at the Berlin Show

T

HE new Alni (aluminum nickel-alloy) steel is finding new applications in the Bosch Works. This new material permits of greatly reducing the dimensions for electro-magnetic generating equipment for a given output. A novelty shown at the Bosch stand was a flywheel magneto for lighting and ignition on motorcycles equipped with two-stroke engines of very small output. Similar magnetics were formerly made of ordinary permanent-magnet steel and then had an output of 5 watts. The new Alni-steel model of practically the same outside dimensions has an output of 15 watts. Bosch also showed a 25 hp. starter for flywheel ring-gear drive, which was said to be the largest starter of this type in the world and suited for the largest sizes of railcar engines. It was wound for 110 volts. Siemens & Halske changed the design of their spark plugs with sintered corundum insulator so that the spark gap is at a greater distance from the combustion chamber wall and deeper in the mass of combustible mixture, which is said to result in an increase in power and a decrease in consumption. For charging motorcycle batteries, this firm is now offering an alternating-current generator to be used in conjunction with a dry type of rectifier, which combination is said to be materially cheaper than the direct-current generator formerly offered for this purpose. Siemens also exhibited a very powerful electric warning signal, called a motor ball alarm. It is intended mainly for police-and fire-department vehicles.

—ATZ, March 10.

The Horizons of Business

(Continued from page 702)

so permeated with reactionary notions as to believe that no man able to work should subsist upon the sweat of his fellow workers. They still cherish a primitive fallacy, which deeply stirs the heart of Dr. Tugwell, that bread should come only to those who labor.

The worthy burghers of Newton, another north Jersey town were provoked during the past winter to discover that the able bodied wards who accepted relief refused to bend their backs or get their fingers cold when deep snow drifts blocked the principal thoroughfares. It was necessary to use a large part of the regular appropriation to get the streets cleared although the town was forced at the same time to contribute to those chronic sufferers euphemistically described as unemployed.

Exquisite Irony

The failure of relief in New Jersey is forcing upon this ugly problem a realistic light and a strong draft of fresh wholesome air. Relief and unemployment are dual and deliberate evils. They pander to the minority which prefers leisure to labor, which will work only under the age old discipline of hunger. Its "unemployment" is the direct result of indulgence. Mechanization, large scale enterprise, the distribution of wealth and income, the relation of spending and saving have little if anything to do with it. That New Jersey politicians, who like national politicians refused to investigate relief, should unwittingly expose it because they squabbled over the funds is a bit of exquisite irony.

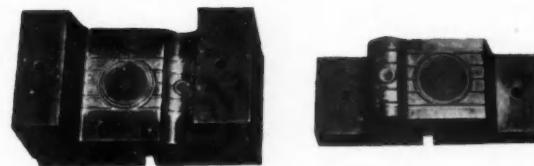
A Ten-Year Plan

A "Ten-Year Plan" worked out in Denmark provides for the construction of two large bridges, one over the Great Belt, the other over the Oeresund together with a great network of automobile roads which will extend through the country from one end to the other, with a total length of 375 miles. The bridge over the Great Belt, which will be approximately 11 miles long, will carry double railroad tracks, a roadway 26 ft. wide and a bicycle path. The bridge over the Oeresund will establish a direct connection between Copenhagen, Denmark and Malmo, Sweden, by way of the island of Saltholm, and will be nine miles long. The system of automobile roads will be modeled after that of Germany, with which it will connect on the German frontier. — *La Technique Moderne*, April 1.

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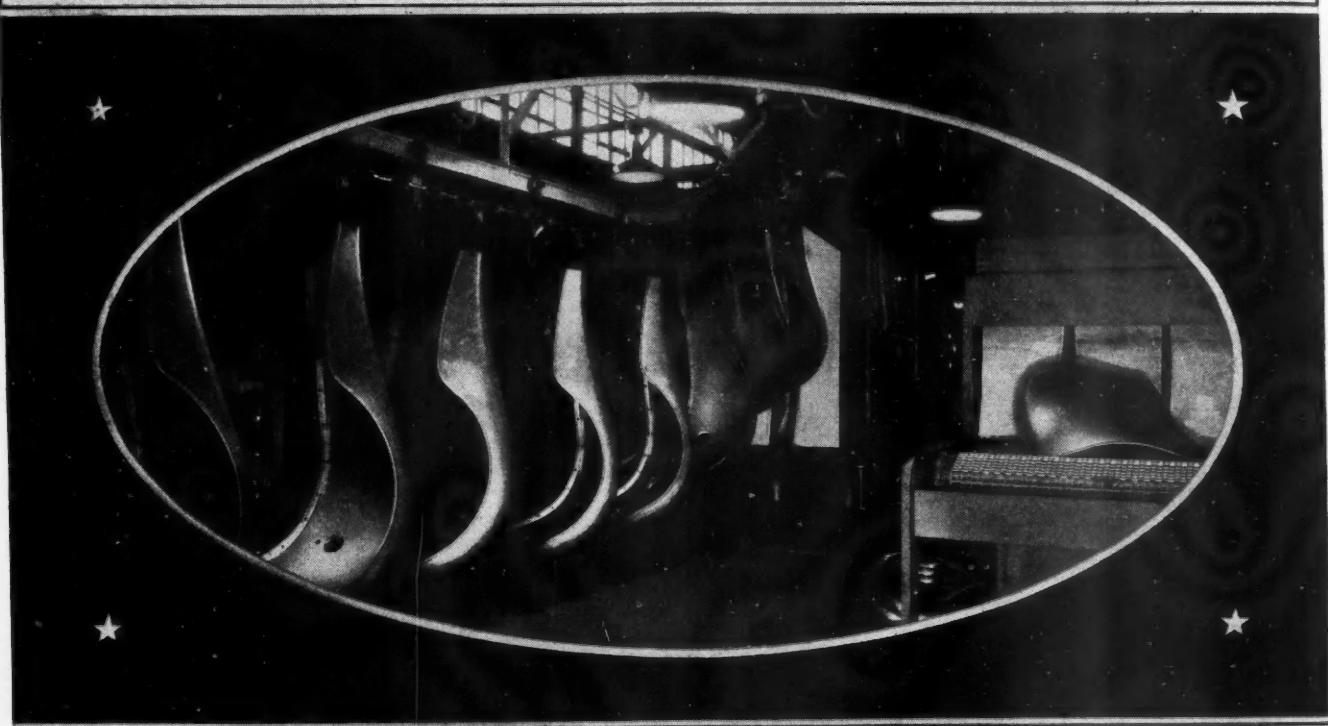
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